

WORKBOOK **in** **BASIC**

V.B. Aggarwal
M.P. Goel



PITAMBAR PUBLISHING COMPANY

WORKBOOK IN BASIC

Second
Edition

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PREFACE TO THE FIRST EDITION

Of the many programming languages that are currently used, none is easier to learn than BASIC. This simple language contains enough power and versatility to be used by many computer professionals for a wide variety of applications. BASIC is fast becoming the "mother tongue" of modern computers and therefore, BASIC programming courses have become common in many schools, as well as Colleges and Universities.

Another reason for BASIC's popularity is its widespread availability. The interpreters and compilers of this language are now available on practically every micro/mini computers and main frame systems. It is supported by virtually all commercial timesharing services. Home and educational computers use this language almost exclusively.

This book presents various exercises and problems in BASIC in a systematic and step-by-step fashion. The first one or two questions of each problems have been solved to illustrate the logic and solution of the problem. This book introduces BASIC through a series of different types of problems in such a way that after solving them correctly, the student will fully comprehend and understand the subject. There is a well balanced exercise set for each chapter, containing problems ranging from some that illustrate the elementary concepts to others that are quite challenging. Flow charting, a powerful aid for programming, has been presented in a simple and logical manner. In selecting the exercises, we have used the simple to complex and self-learning approach throughout the book. A great deal of attention has been given to make the material comprehensive, concise and practical.

The style of writing is deliberately elementary. This enables the book to be easily understood by a vast majority of readers ranging from high school students to university students. The book is particularly well-suited to the secondary, senior secondary or beginning college level, either as a text book for an elementary programming course or as an effective self study guide. Each chapter contains large variety of questions and exercises, designed to provide an insight into methods and applications of the language.

One of the salient features of this book is that a complete glossary has been provided in the first chapter. Various computer terms have been fully described so that students could know their precise meaning.

To make the book more useful to professionals and practitioners, five programming assignments from real-life situations have been incorporated in a separate chapter. They form a part of the practical work to be done by the students and illustrate the usage of computers in real life situations.

The reader who completes this book, will have learnt a great deal about general computer-programming concepts as well as the specific rules of BASIC. He or she will realise that programming in BASIC is not only easy but also fun.

V.B. AGGARWAL
M.P. GOEL

PREFACE TO THE REVISED EDITION

We welcome the overwhelming response of the readers to this workbook as the first edition has been exhausted in a short span of six months. It has encouraged us to revise the workbook. We have taken care to remove the printing errors in this edition. Some improvements have been incorporated to make the workbook more useful.

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1. GLOSSARY OF COMPUTER TERMS

- Access Time :** The time required to communicate with the memory unit of a digital computer.
- Accumulator :** Register in a central processing unit of the computer to store the results of arithmetic or logical operations.
- ALGOL (*ALGO*rithmic Language) :** Acronym for *ALGO*rithmic Language. It is a high-level algebraic-oriented programming language used for scientific applications.
- Algorithm :** A sequence of well-defined steps that leads to the solution of a problem.
- Alphameric (*Alphanumeric*) :** It refers to a character set which contains letters, numerals and other characters referred to as special characters.
- Analog Computer :** A computer that measures and processes continuously varying quantities such as voltage and current etc.
- Arithmetic-Logical Unit :** The component of a digital computer which performs arithmetic and logical operations on data.
- Assembler :** A computer program which is used to translate a source program written in assembly language into object code.
- BASIC :** Beginner's All-purpose Symbolic Instruction Code, a programming language developed by Kemeny and Kurtz for use as an interactive language.
- Batch Processing :** A method of computer operations where the user submits a program and data together and gets the results after some period of time.

Binary :	Referring to a numeration system in which two possibilities (0 or 1) represent any given number.
Bit :	Abbreviation for Binary digit. A character used to represent any one of two digits in the binary system.
Buffer :	A storage area used to hold data in order to compensate for the difference in processing speeds between two devices.
Byte :	A group of bits, usually 8 bits, treated as one unit for storage of information.
Cache Memory :	A very high-speed buffer memory into which instructions from main memory are buffered so that they may be executed at much higher rates than if executed directly from main memory.
Central Processing Unit :	Component in a computer system that controls the interpretation and execution of instructions. It consists of Control Unit and Arithmetic-Logic unit.
Character :	Any single letter of the alphabet, numeric digit or special symbol.
COBOL (COMMON BUSINESS ORIENTED LANGUAGE):	A Computer language designed specially for business data processing.
Compiler :	A computer program which translates a program written in a high-level language into machine code.
Computer :	An electronic device which can input, store and manipulate data and output information in a desired form.
Computer Program :	A set of instructions written in a computer language for solving a given problem.
Computer System :	A computer with its associated equipments and programs.
Constant :	A quantity that does not change during the execution of a program.
Core Memory :	See Main Memory.

CRT :	Cathode Ray Tube—used in visual display units called terminals.
CycleTime :	The time required to locate and fetch information from any location of core memory to the processing unit.
Data :	Input values given to a computer for manipulation or processing.
Data Base :	A set of interrelated data records stored on a direct access storage device in a data structure that is designed to allow multiple independent accesses to records and to have minimal redundancy of data.
Data Processing :	The input-output, storage and analysis of information in a systematic and logical manner by a computer system.
Data Communication :	Transmission of data over a distance through an appropriate communication channels, usually telephone lines.
Debugging :	The process of finding and eliminating errors from a computer program.
Diagnostic :	An error found by the computer during translation of a source program.
Digital Computer :	A computer that operates by performing arithmetic and logical operations on discrete data. It 'counts' rather than 'measures'.
Direct Access :	Accessing records from a file directly without searching from the beginning of the file.
Disk Drive :	A magnetic storage device in which data and instructions can be written, stored and accessed.
Distributed Processing :	The processing of jobs at a number of geographically seperated locations.
Documentation :	A collection of written descriptions and procedures that provide information and guidance about a program or about all or part of a computer system so that it can easily be used.

EBCDIC :	(Extended Binary Coded Decimal Interchange Code) The code that uses eight bits to represent symbols. It is the principal coding scheme for IBM 360 and IBM 370 computers.
Editing :	Process of carrying out corrections in a file containing a program and/or data.
Error Message :	Message given by a computer indicating that an error has occurred during the running of a program.
File :	A collection of records which are logically related to each other and handled as one unit, for example, by giving them a single name.
File Organisation :	The way in which the records are stored and accessed on a file.
Firmware :	A word used to indicate something which is between software and hardware. It nearly always refers to programs which are held in ROM (read-only memory).
Floppy Disk :	A small storage disk made of a flexible piece of Mylar and coated with magnetic materials.
Flowchart :	A pictorial representation of the sequence of steps of computation for solving a problem.
FORTTRAN(Formula TRANslation)	A high-level programming language designed by IBM in 1957 for scientific applications.
Gate :	An electronic circuit that has one or more input signals and produces a single output of binary 1 or 0, depending on the type of logic built into the circuit.
General Purpose Computer :	A computer which is designed to handle all applications, such as business and scientific, equally well rather than being specifically designed for one such function.
Graph Plotter :	An output device which is able to draw

	graphs on paper by means of a moving pen.
Hardware :	The electronic and other equipment in a computer system.
High-Level Language :	Any programming language which is machine-independent and is written in a way that is easy for human beings to understand and implement.
Home Computer :	A small computer for use in the home, for example, for use in keeping accounts, playing games etc.
Hybrid Computer :	A computer which combines the features of both digital and analog computers.
Information :	Data organized in a meaningful way.
Input Device :	A device which reads data and instructions and feeds them into a computer.
Interactive Mode :	The mode of use of a computer system in which users directly communicate with the computer and receive immediate responses.
Job :	A number of tasks which constitute a single unit of work for a computer system.
Job Control Language:	A language which defines a job and the resources it requires from the computer system.
Library :	See Program Library.
Line Printer :	A device that prints a whole line of characters at one time under computer control.
Linkage :	A sequence of instructions that connects two separate program modules.
Liveware :	This term is used for the people associated with a computer establishment.
Loop :	A set of statements that are executed repeatedly.

Low-Level Language :	A programming language providing machine instructions of a particular computer.
LSI :	Large scale integrated circuit which contains thousands of miniaturized components.
Machine Language :	The language consisting of the set of all machine codes for a particular computer.
Magnetic Core :	Small rings of magnetic material called ferrite, used in internal storage.
Magnetic Disk :	Circular plate coated with magnetic material and used to store data.
Magnetic Tape :	A tape coated with magnetic material and used to store data.
Main Memory :	A component of central processing unit that stores data and programs.
Micro processor :	A central processing unit implemented by means of a single chip using LSI or VLSI techniques. The term 'micro-processor' should be distinguished from microcomputer which contains other components such as memory and I/O chips
Micro-Second :	One millionth of a second.
Milli-Second :	One thousandth of a second.
Micro computer :	A small, low-cost computer containing a micro processor, it has a random-access memory (RAM) for storing programs during their execution. It also contains a read only memory (ROM) for permanent storage of required programs, such as BASIC interpreter.
MIS :	<i>(Management Information System)</i> A system designed to provide the information required for decision-making to various levels of management.
Multi-processing :	The technique of executing program using multiple processors.
Multi-programming :	Computer system process in which

	several programs reside in main memory and are processed concurrently.
Nano-Second :	One billionth of a second.
Object Program :	A program in machine language generated by a compiler/assembler.
Off-line :	Referring to equipment or devices not under direct control of the central processing unit.
On-line :	Referring to equipment or devices under direct control of the central processing unit.
Operating System :	A set of programs that controls and supervises the running of programs and the utilization of various computer resources. This is usually provided by the manufacturer along with the hardware.
Output :	The results printed under control of a computer program.
Overlay :	A technique used to run a large size program in a small memory by using the same area of main memory for storing different segments of a program.
Overlay Program :	A program which is segmented so that segments may overlay one another.
Package :	A complete program with all necessary documentation in a ready-to-use stage.
Parity Bit :	A binary digit appended to a string of bits to enable detection of errors.
Password :	A set of characters which must be quoted before the user is given access to a specified resource, such as an interactive system or a file.
Peripherals :	Input/output devices connected to a computer.

PL/1 (<i>Programming Language/one</i>) :	A problem-oriented computer language designed for programming both scientific and commercial applications.
Program :	See computer program.
Program Library :	A collection of standard routines and subroutines which are useful in solving many problems.
RAM :	An acronym for random access memory, see main memory.
Random Access :	See direct access.
Real Time :	Processing of input data and communication of results within a pre-specified interval of time.
Record :	A group of related items of data which are considered as one entity.
Remote Terminal :	A computer terminal located at a distant place and connected to the computer by a communication line.
Response Time :	The period of time elapsed between input of a query and receipt of a response at the terminal.
ROM :	An abbreviation for read-only memory, that is, memory which may be read from but not written to, hence ensuring data or program integrity.
Secondary Storage :	A storage device in addition to the main storage of a computer; e.g. Magnetic tape, disk, drum etc. Secondary storage usually holds much larger amounts of data with slower access time than main storage.
Seek Time :	The time taken for the read/write heads on a disk to move to the selected track.
Sequential Access :	Retrieval of records in a file from the beginning of the file one-by-one in a sequential manner.
Serial Access :	See sequential access.
Serial Computer :	A computer which processes bits within a word in sequence.

Software :	The programs, routines, and techniques developed for the most efficient use of computer hardware. Software includes operating systems, compilers, mathematical routines and application programs.
Sort :	To arrange the records in ascending or descending order according to given keys.
Source Program :	A program written in a high-level language.
Storage Capacity :	The amount of data that can be stored in a device. Generally it is expressed in terms of kilo-bytes or mega-bytes.
Storage Location :	It is a position in the main memory having a unique address and capable of storing one unit of information.
Stored Program Computer :	A computer in which the instructions in the program are stored internally in exactly the same way as data. Virtually all modern computers implement the stored program concept.
Sub-routine :	A group of statements to perform a particular function that may be used repeatedly within a program.
System :	An aggregate of hardware, software and personnel organised to perform a function or functions.
Systems Analysis :	The examination of an activity (usually a business activity) to determine how best the same activity could be carried out with the help of computer.
System Analyst :	A person who does system analysis and design.
System Command :	An instruction which is not part of a program but is used to do other useful operations, such as dir, copy etc.
Terminal :	A device consisting of a key-board and a screen used for communicating with a computer system.

Time sharing :	A mode of computer operation in which many users make use of the computer system simultaneously by sharing its resources. It is usually done through terminals.
Turnaround Time :	The time taken for completion of a job from the time of submission to the time of getting results in a batch processing mode.
Update :	To modify a file in accordance with events that have taken place. It is used in particular to indicate the changing of a master file according to transactions which have occurred since it was last updated.
VDU :	An acronym for visual display unit. An I/O device which consists of a keyboard and a CRT screen.
VLSI :	An acronym for very large scale integration. VLSI chip may contain about a lakh of miniaturized components.
Word Processor :	A software package to aid text processing.
Work Area :	An area of storage (usually main memory) used for storing temporary results.

2. FUNDAMENTALS OF COMPUTER

1. You are given a list of correct answers at the end of this question.
You are required to fill up the blanks by selecting a suitable answer from the list.

- (i) Raw are of limited use
and must be processed to become usable
.....for management.
- (ii) An electronic device which can input , store and manipulate data and
output information in a desired form is called a
- (iii) A logical list of operations or steps for solving a given problem is called
a
- (iv) A sequence of instructions written in a programming language for a
Computer to solve some given problem is called a
- (v) The Computer system operates in two modes which are
mode andmode.
- (vi) Two types of Computers, based on the classification with respect to
data representation are and.....
- (vii) The commonly used terminals are : teletypewriter and
- (viii) The world's first digital computer, called
..... was
developed jointly by International Business Machines and Harvard

University in 1944.

- (ix) The calculating device developed in China around 2200 B.C. was the
- (x) The first commercial computer was
built by Sperry Rand Corporation.
- (xi) In the time-sharing mode, the user communicates with the computer
via a
- (xii) The first-generation of computers utilized the vacuum tube, the
second-generation computer the
and the third-generation computer thechips.
- (xiii) Computers generally operate in 'the number system.
- (xiv) A is a special purpose device that
controls input/output operations. It relieves the CPU of the task of
communicating directly with input/output devices.
- (xv) is a computer program which translates
a program written in a high-level language into machine code.
- (xvi) The total system of a computer installation consists of three basic
elements namely the hardware,
and
- (xvii) The standard punched card is divided into
columns and rows, with each column

being capable of holding one
of information.

(xviii) In a environment, several programs are present in
memory at one time.

(xix) To read data from (and write it to) peripheral devices in parallel with
normal job processing via a faster medium is called

(xx) A means of inputting data directly from a machine similar to a
keypunch directly onto magnetic disk is called

Jumbled list of Answers for question 1

Program, Spooling, Terminal, Batch, Time-sharing, Univac-I, Abacus, Binary,
Visual-display Unit, Algorithm, Computer, Compiler, Software, Humanware, Mark-
I, Key-to-disk, Transistor, Integrated Circuit, 80,12, Character, Data, Information,
Digital, Analog, Channel, Multiprogramming.

2. In the following sentences, write *T* against the True statement and *F* against the False one.

- (i) Main memory, Primary storage and Internal storage all refer to the same component. T/F
- (ii) In the memory, there are separate locations for storing program and data. T/F
- (iii) Computer hardware has no intelligence, as it cannot even find simple interest or area of a rectangle by itself. T/F
- (iv) All numbers must be stored into the computer in binary form. T/F
- (v) Digital computers operate essentially by counting and Analog computers operate by measuring rather than by counting. T/F
- (vi) Computers which combine features of both analog and digital type are called *Hybrid* computer. T/F
- (vii) Access time is the time required for the transfer of information from the disk drive to the printer. T/F
- (viii) An error in a computer program is known as a bug and the process of elimination of bugs is called debugging. T/F
- (ix) In time-sharing, the resources of a computer system are available to one program only. T/F
- (x) The most popular language for interactive or conversational use is FORTRAN. T/F
- (xi) The most important characteristic of a high-level language is that it is machine-dependent. T/F
- (xii) The first electronic machine known as ENIAC stands for Electronic Numerical Integrator And Computer. T/F
- (xiii) A pictorial representation of steps of computation for solving a problem is called Program. T/F
- (xiv) Data can move from printer to memory at a fast speed. T/F
- (xv) Each memory location has a corresponding address. T/F
- (xvi) The term software refers to such material as punched cards, paper/magnetic tape etc. T/F
- (xvii) In a batch-processing environment, the user receives an almost instantaneous response to his program. T/F
- (xviii) Multiprogramming means that instructions from two or more programs can be processed at the same time by the CPU. T/F

(xix) A byte refers to a group of bits to designate a single alphanumeric or special character T/F

3. *You are given a list of correct answers at the end of this question. You are required to fill up the blanks by selecting a suitable answer from the list.*

- (i) is a small movable symbol which appears on the screen to indicate the current position.
- (ii) is a system command which shows a program on CRT.
- (iii) The instructions that are required to prepare and run a program on the computer are called commands.
- (iv) is the front of a Cathode Ray Tube on which output is displayed.
- (v) The technique in which data may be transmitted to the CPU from a distant place via telephone lines is called
- (vi) A software package to aid text processing and produce letters etc. is called
- (vii) A board containing all characters and special keys through which data and instructions are keyed into a computer is called
- (viii) Operation carried out under the control of CPU is called

-operation.
- (ix) is a device connected to a computer and used to input data or output result.
- (x) BASIC stands for Beginner's All-purpose Code.

Jumbled list of Answers for Question 3:

System, On-line, Keyboard, Screen, Cursor, Symbolic, Instruction Terminal, Telecommunication, List, word processor.

4. In the following sentences, write Tagainst True statement and F against the False one

- | | |
|---|-----|
| (i) Key-in or type means to communicate to the CPU what you want to say by pressing the right keys. | T/F |
| (ii) Before a person can make use of a conversational system, it is generally necessary to have an assigned account number and perhaps also a special password. | T/F |
| (iii) A program statement cannot be deleted entirely by typing its line number followed by a CR (Carriage Return) key. | T/F |
| (iv) The floppy disk devices are not very much popular with micros,minis and small computer system. | T/F |
| (v) The CRT Terminals consist of a television-like screen for display and a typewriter-like keyboard for entering data. | T/F |
| (vi) The appearance of the prompt symbol (>) on the screen means that computer is busy and will not accept any command. | T/F |
| (vii) Carriage Return (CR) is a very important key which is used to instruct the computer to execute whatever has been entered. | T/F |
| (viii) CTRL is a control key on the keyboard which is mainly used to control the speed of computer. | T/F |
| (ix) BRK is a break key on the keyboard which is used to regain keyboard control when a BASIC program is running. | T/F |
| (x) Major advantages of the present-day terminals are direct entry of data and quick response. | T/F |

5. Name five Programming languages that are popularly used in modern days.

- (i)
- (ii)
- (iii)
- (iv)
- (v)

6. Explain the functions of the following units of a Computer System.

- (i) INPUT :
- (ii) OUTPUT :
- (iii) ARITHMETIC :
- (iv) MEMORY :
- (v) CONTROL :

3. FLOWCHARTING

1. *You are given a list of correct answers at the end of this question. You are required to fill up the blanks by selecting a suitable answer from the list.*

- (i) is a diagrammatic representation that illustrates the sequence of operations to be performed to solve a problem.
- (ii) The direction of flow in a flowchart is usually from to and from to
- (iii) A symbol represents an
- (iv) All symbols in a flowchart must be connected by a
- (v) Each symbol in a flowchart contains a inside it
- (vi) Several may be represented by one flowchart symbol.
- (vii) A flowcharting tool, called a contains all the standard symbols used to draw flowchart.
- (viii) Arithmetic operations are coded in symbol.
- (ix) are used to join remote portions of a flowchart.
- (x) The flowchart is one of the best ways to a problem and to develop the logic for its program.

- (xi) A symbol is used at the beginning and end of a flowchart.
- (xii) The number of flow-lines leaving a processing-box is
- (xiii) refers to the process of following one out of two or more alternate paths of computation.
- (xiv) refers to the repeated use of one or more steps.
- (xv) The number of flow-lines leaving a decision-box is

Jumbled list of answers for question 1

Note, Operations, Connectors, Looping, Top, Bottom, Left, Right, Flowchart, Flowline, Processing, Two, Analyse, Operation, Template, Terminal, One, Branching

2. Write down the name of the symbol against each of the following :

(i)



Processing symbol

(ii)

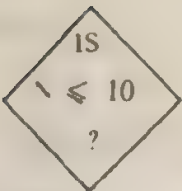

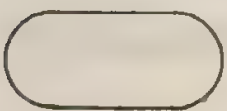


.....

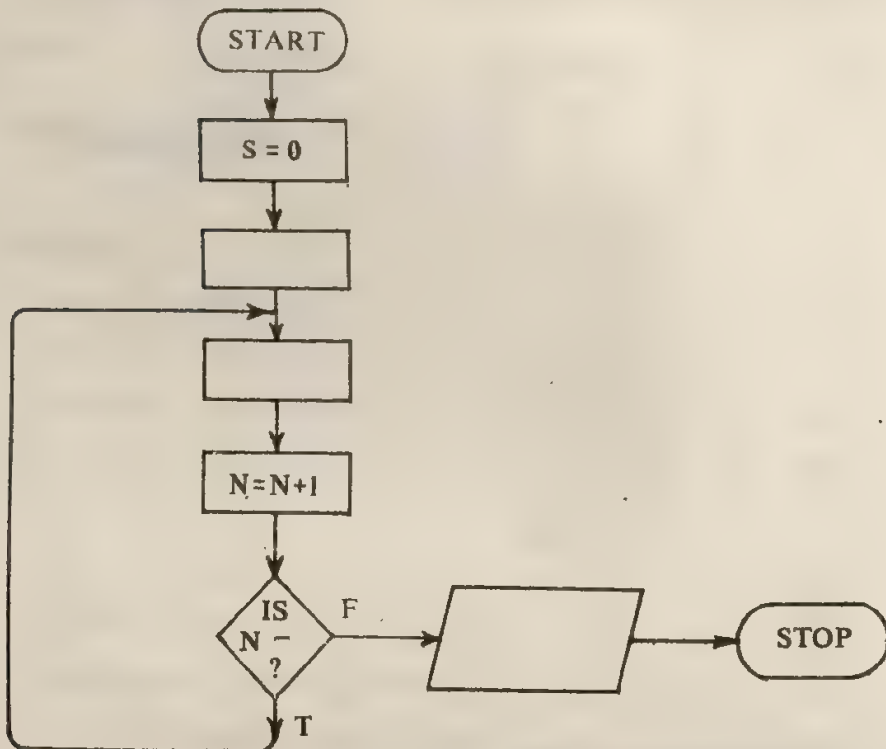
(iii)



.....

- (iv) 
- (v) 
- (vi) 

3. A flowchart for calculating and printing the sum of first 100 positive integers is given below. Write down the correct operations in the symbol.

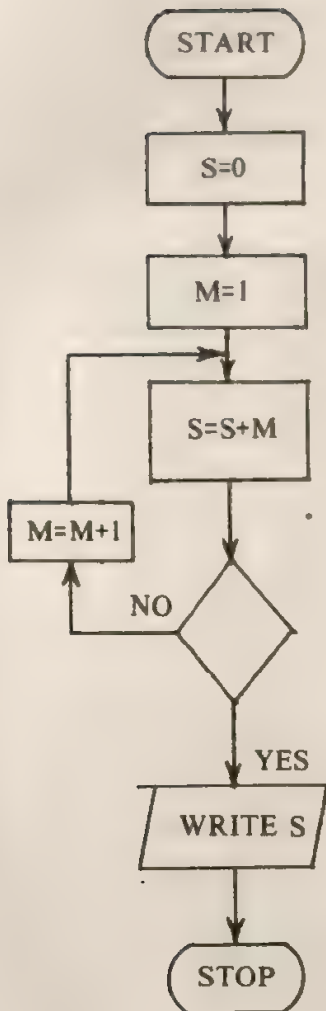


4. Following are the three different flowcharts to calculate the sum :

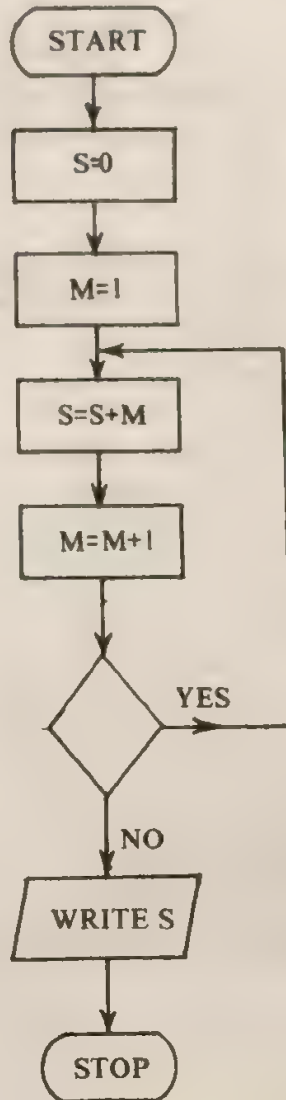
$$1 + 2 + 3 + 4 + \dots + 20$$

Which one of the following conditions would you use in the decision symbol to obtain the correct result in each case?

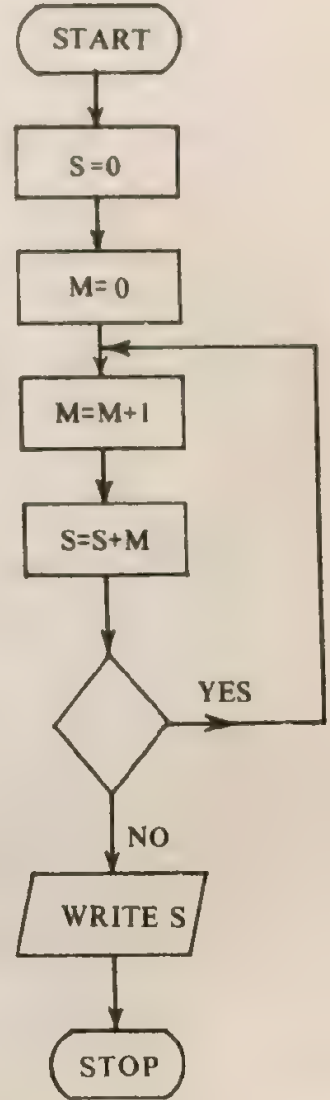
- (i) $M=20$ (ii) $M>20$ (iii) $M=0$ (iv) $M>20$ (v) $M\leq 20$ (vi) $M<20$



(a)

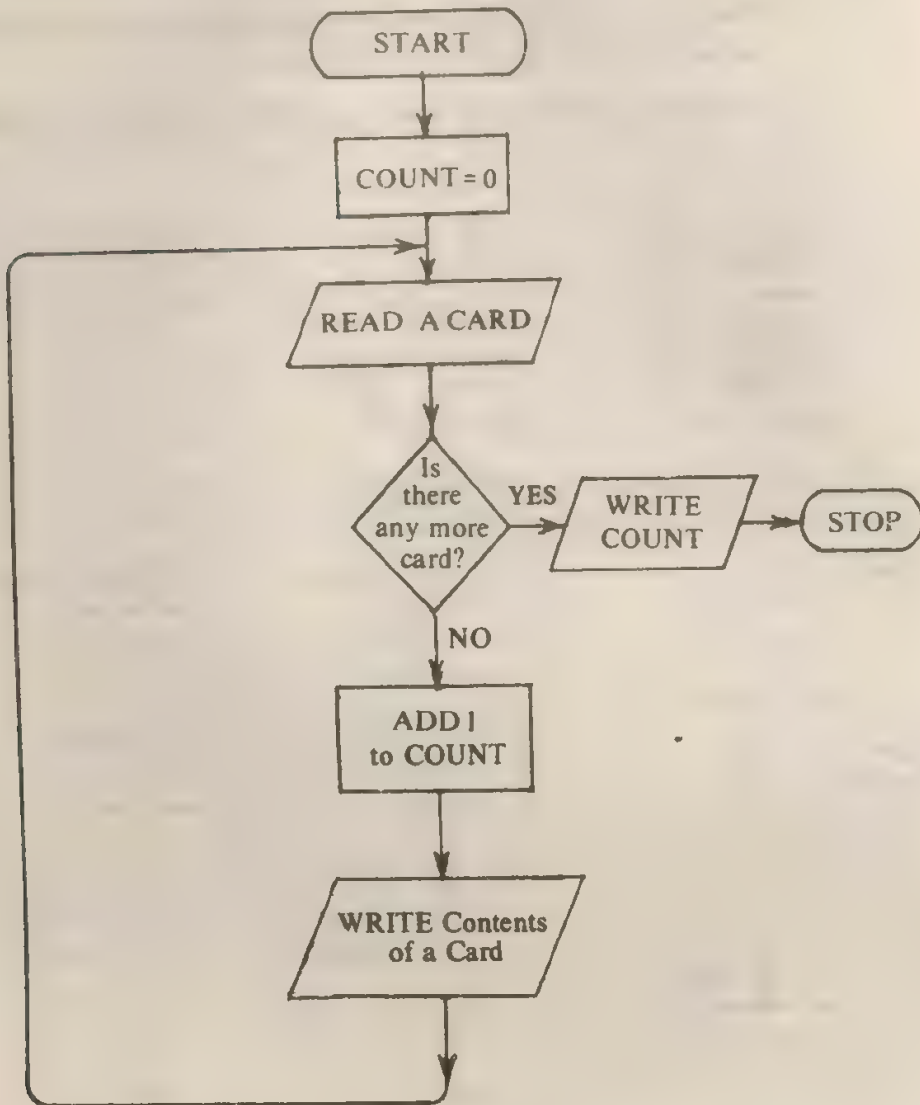


(b)



(c)

5 For the given flowchart, answer the following questions by writing T or F against them



- (i) Each read instruction should be associated with an end-of-file test.
- (ii) At the end of job, count will always Contain 1
- (iii). Even if the number of cards are more, only one card is read according to this flowchart

T/F

T/F

T/F

(iv) The program flowchart contains a logically correct set of operations. T/F

(v) Content of COUNT will be printed after the job is over. T, F

6. For the following flowchart, a list of correct answers is given at the end of this question. You are required to fill up the blank by selecting a suitable answer from the list.

(i) For every (number) cards read, one line is printed.

(ii) When there are no more cards, a occurs.

(iii) INDEX is a field used as a for

(iv) After 10 cards have been read and added, a branch to occurs.

(v) After the data has been printed for each group of 10 cards, and must be initialised.

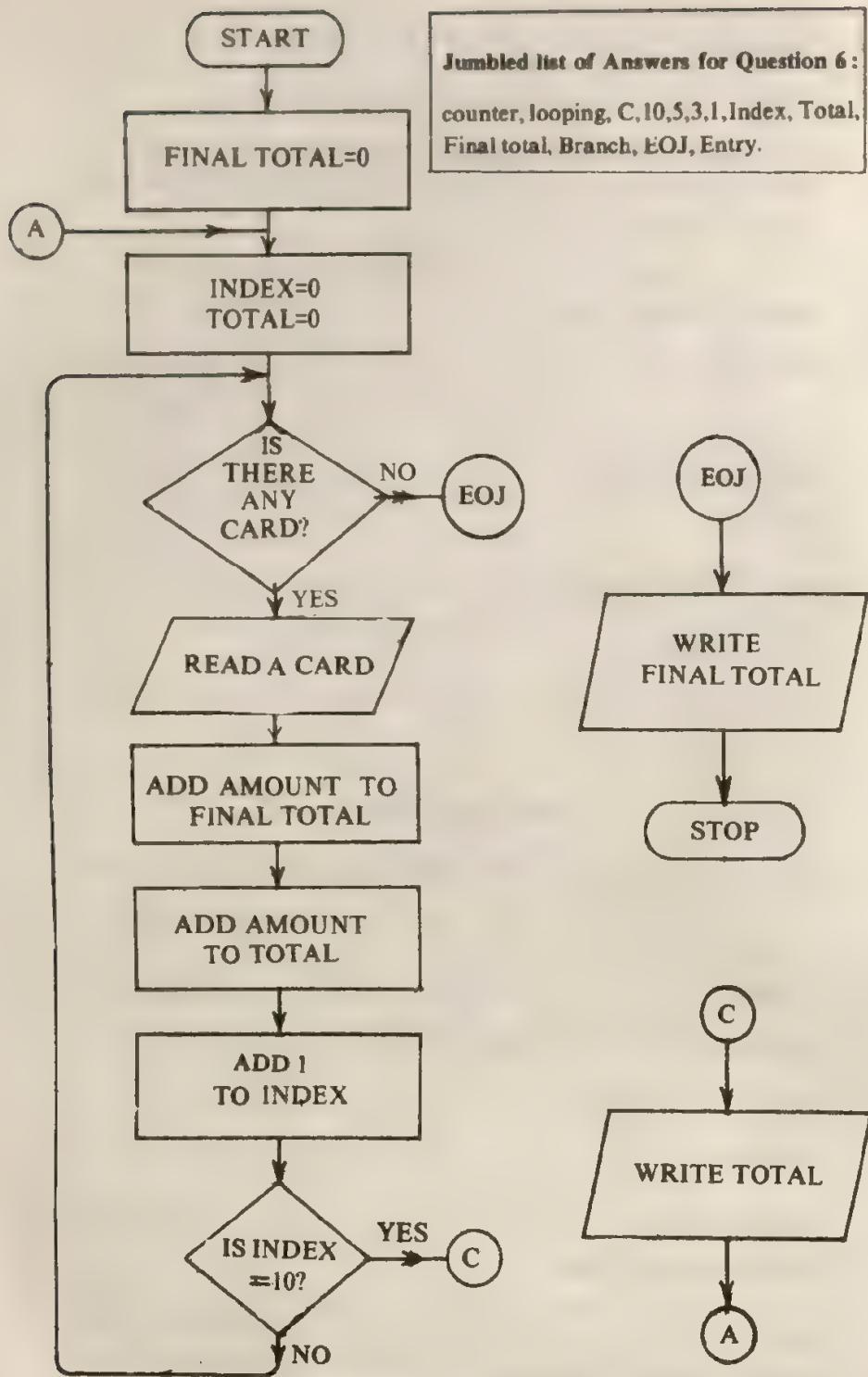
(vi) Each time a card is read and an amount is added to total, (number) is added to INDEX.

(vii) At EOJ is printed which is obtained from the total of all amount fields.

(viii) Symbol A is called connector.

(ix) There are (number) processing symbols in the figure.

(x) (number) Input/Output symbols have been shown in the figure.

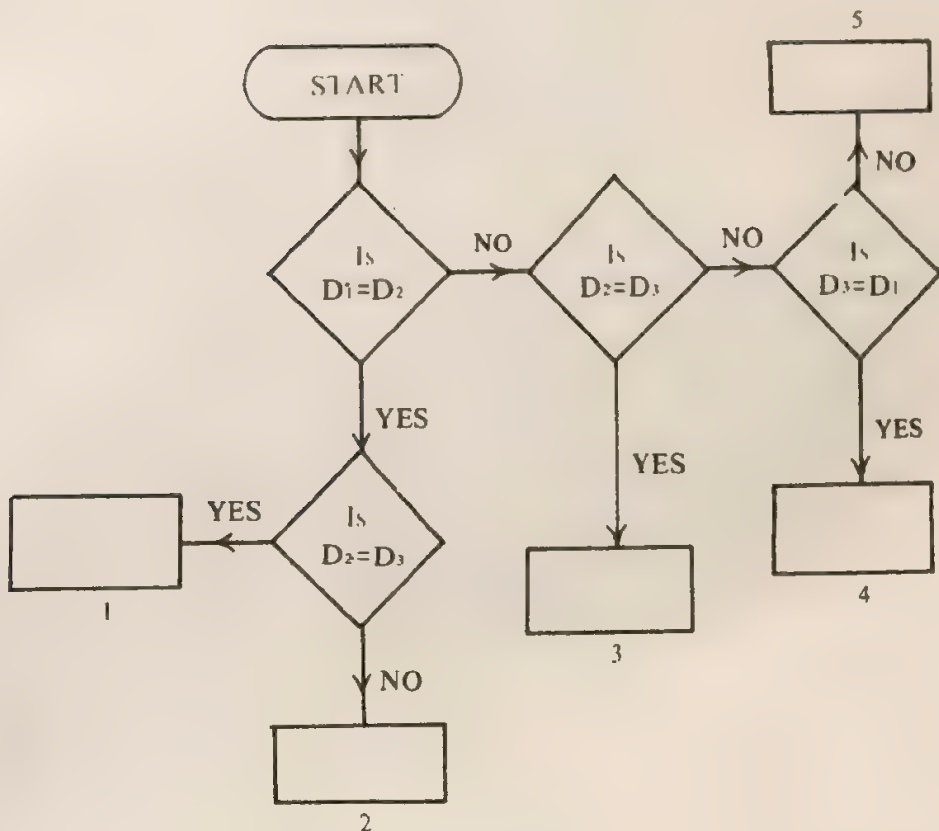


- 7 Three dices D_1, D_2 and D_3 are thrown on the table. The value of any one of the three dice can be 1, 2, 3, 4, 5 or 6. Complete the flowchart by putting one of the letters P, Q or R into the boxes numbered 1 through 5, where

P All the three dice are equal,

Q Two of the three dice are equal,

R All the three dice are different.



8. The value of n factorial ($n!$) is equal to $n(n-1)(n-2)\dots\dots\dots 3.2.1$
Draw a flowchart to calculate and print the value of $n!$ where n represents an integer whose value will be read each time the program is run.

9. Draw a flowchart to compute and print the grades for an examination. Input is Roll No. and marks in five subjects out of 100. Grades are allotted on the following basis :

Percentage of marks	Grade
90 and above	'A'
80 and less than 90	'B'
70 and less than 80	'C'
less than 70	'D'

10. A company has a number of salesmen selling two varieties of cloth, namely Cotton and Terecot. The company gives 6% commission on sales of Cotton cloth and 5% on Terecot. Further, on Cotton sales above Rs. 8000, 7% commission is given and on Terecot sales above Rs. 15000, 6% Commission is given. Draw a flowchart to compute and print the commission earned by a salesman.

The input to the program consists of salesman number, cotton and terrycot sales. The output should give salesman number, total sales, his commission on cotton and terricot sales and the total commission.

4. ELEMENTS OF BASIC

1. Express each of the following quantities as a BASIC number.

Quantity	BASIC number
(i) 7,265	7265
(ii) -135
(iii) 10^4
(iv) $-3,064.19 \times 10^3$
(v) 0.0007302
(vi) 5.962×10^{16}
(vii) $\frac{3}{5}$
(viii) -7,358,600
(ix) 0.3284×10^{25}
(x) -1.7324×10^{-19}

2. Following BASIC numbers are written incorrectly. Identify the errors and give the correct form.

BASIC number	Error	Correct form
(i) 4,5781	Comma is not permitted	45781
(ii) +- .357
(iii) 2.573 E +83
(iv) 0.571-
(v) 5.65 E-0.5
(vi) 5.49 E
(vii) $8.34 - E5$

- (viii) 8.33333333E-4
 (ix) 23.24..
 (x) 111-25

3. Following numeric Variables are written incorrectly. Identify the error and give the correct form.

Numeric Variable	Error	Correct form
(i) XY	Second Character if present, must be an integer	X1 or Y1
(ii) GOEL
(iii) A*
(iv) 7B
(v) 15
(vi) H12
(vii) AS
(viii) CL\$
(ix) P%
(x) A,1

4. Determine whether the following BASIC strings are valid or invalid. Give reason if invalid.

BASIC string	VALID/INVALID	Reason if invalid
(i) COMMON BUSINESS ORIENTED LANGUAGE	Invalid	Too long for some versions of BASIC
(ii) \$1, 955.00
(iii) AUGUST 5, 84
(iv) 5 O'CLOCK
(v) "NUTS!"

- (vi) A="B+C"
- (vii) SIXTY-SEVEN
- (viii) WHAT IS YOUR NAME, SIR
- (ix) 78.62
- (x) SYMBOL IS "Y"

5. Following string variables are written incorrectly. Identify the error and give the correct form.

String variable	Error	Correct form
(i) BA1\$	Too many characters	B1\$
(ii) C5
(iii) A\$6
(iv) \$A1
(v) P+\$
(vi) ACS
(vii) GOSEL
(viii) "A\$"
(ix) \$\$
(x) 5C%

6. Write the equivalent BASIC expression for the following algebraic expressions.

Algebraic expression	BASIC expression
(i) $3a+5$	$3*A+5$
(ii) a^2+b^2	.....
(iii) $(a-b)^4$	.....
(iv) $\frac{a}{b} + \frac{c}{d}$	.....

- (v) $(1-m)^{n+1}$
- (vi) $(5a)^{\frac{1}{2}}$
- (vii) $\frac{a+b}{a-b}$
- iii) $\frac{a^2-b^2}{a^2-h^2} + 3ab$
- (ix) $a^3+b^3+3ab(a+b)$
- (x) $\frac{(a^2)^3+(b^2)^4}{(a^2)^3-(b^2)^4}$

7. Write a LET statement for each of the following operations.

- (i) Assign a value of 100 to the variable A. LET A=100
- (ii) Assign a value of 2.5 to the variable B.
- (iii) Assign the value represented by the variable K to the variable L.
- (iv) Assign the string M.P. GOEL to the variable A\$.
- (v) Assign the string represented by the variable P\$ to the variable Q\$.
- (vi) Assign the value represented by the formula (a^4+b^4) to the variable C.
- (vii) Increase the value assigned to the variable I by 1
- (viii) Assign the value represented by the formula $(L+M)$ to the variable L.
- (ix) Decrease the value assigned to the variable K by 5
- (x) Double the value assigned to the variable A1.

8. Write a LET statement for each of the following algebraic equations.

$$(i) \quad a = \frac{2b}{3} - 7$$

$$10 \text{ LET } A=2*B/3-7$$

$$(ii) \quad a = \frac{bc}{d-5}$$

.....

$$(iii) \quad n = \frac{(1+m)^2}{(1-m)^2}$$

.....

$$(iv) \quad l = \frac{c}{a+b} + \frac{3d}{4e}$$

.....

$$(v) \quad k = a_1 - a_2x + a_3x^2$$

.....

$$(vi) \quad s = \frac{ra(1+r)^n}{i}$$

.....

$$(vii) \quad b = \frac{7.8c - 5.2d}{\sqrt{c+d}}$$

.....

$$(viii) \quad a = \frac{2bc}{d+5} - \frac{s}{3(t+2)}$$

.....

$$(ix) \quad d = (y+a^x + 7b)/2c$$

.....

$$(x) \quad c = p(1 + k/n)^{nd}$$

.....

9. Two complex algebraic equations are given below. Replace each equation with several simple equations and write the corresponding LET statements.

$$(i) \quad m = \left[\frac{pq}{r-1} - \frac{3s}{6(p+q+r)} \right] \frac{1}{d}$$

$$m_1 = \frac{pq}{r-1}$$

.....

$$m_2 = \frac{3s}{6(p+q+r)}$$

.....

$$m = (m_1 - m_2) \frac{1}{d}$$

.....

$$(ii) \quad I = \frac{5.1(p+q+r)^2 - 8.1pq\sqrt{p+2q}}{((p-q-r)^2 - \frac{1}{3}n)^{1/2}}$$

$$I_1 = 5.1(p+q+r)^2$$

$$I_2 = 8.1pq\sqrt{p+2q}$$

$$I_3 = ((p-q-r)^2 - \frac{1}{3}n)^{1/2}$$

$$I = \frac{I_1 - I_2}{I_3}$$

10. Give the correct form of the following LET statements.

- | | | |
|--------|----------------------------------|-----------------------|
| (i) | 10 LET A,B =10,15 | 10 LET A=10: LET B=15 |
| (ii) | 20 LET 100=1 | ..... |
| (iii) | 30 LET P\$ = 36 | ..... |
| (iv) | 40 LET N = "NAME" | ..... |
| (v) | 50 LET NAME = "GOEL" | ..... |
| (vi) | 60 LET A=B+"C" | ..... |
| (vii) | 70 LET A1 = 3,156 | ..... |
| (viii) | 80 LET AS =
"V.B."+"AGGARWAL" | |
| (ix) | 90 LET "DELHI" = N1\$ | ..... |
| (x) | 100 LET A1 = A1\$ | ..... |

11. What value will be stored in A by each of the following formulas?

- | | | |
|-------|--------------------|-------|
| (i) | 10 LET A = 2↑3↑2 | 64 |
| (ii) | 20 LET A = (2+3)↑2 | ..... |
| (iii) | 30 LET A = 2+3↑2 | ..... |
| (iv) | 40 LET A = (2*3)↑2 | ..... |

- (v) 50 LET A = 2*3↑2
- (vi) 60 LET A = 2-3↑2
- (vii) 70 LET A = (2-3)↑2
- (viii) 80 LET A = 2-(3↑2)
- (ix) 90 LET A = 2+(3↑2)
- (x) 100 LET A = 2*(3↑2)

12. Which of the following sets of statements will interchange the constants stored in locations X and Y? Write "YES" or "NO" against each.

- (i) 10 LET X = Y
20 LET Y = X
- (ii) 10 LET T = X
20 LET Y = T
30 LET X = Y
- (iii) 10 LET X = Y
20 LET T = X
30 LET Y = T
- (iv) 10 LET T = X
20 LET X = Y
30 LET Y = T
- (v) 10 LET T = Y
20 LET X = Y
30 LET Y = T

5. INPUT/OUTPUT STATEMENTS

1. Consider the following program segments in BASIC and show the printout.

(i) 10 DATA 10, 15

20 READ A,B

30 LET A = A+1

40 LET B = A+B

50 PRINT A 11

60 PRINT B 26

(ii) 10 DATA 5, 6, 7

20 READ A, B, C

30 LET D = A*A+B*B+C*C

40 LET E = A+B+C

50 PRINT D,

60 PRINT E

70 END

(iii) 10 DATA 10,20,30,40

20 READ P,Q,R,S

30 LET P = R+S

40 LET Q = P-Q

50 LET R = P+Q

60 LET S = P+Q+R

70 PRINT P,Q

80 PRINT R,S

90 END

2. Consider the following program segments in BASIC and show the printout.

(i) 10 READ F,C,K,R,L

20 DATA 78,80,84,100,150

30 LET N = 5

40 LET A = (F+C+K+R+L)/N

50 PRINT F,C,K,

60 PRINT R; L;

70 PRINT A

80 END

(ii) 5 DATA 8,6

10 READ R1,R2

20 LET A = $3.14159 * (R1 \uparrow 2 - R2 \uparrow 2)$

30 PRINT R1;R2

40 PRINT A

50 END

(iii) 10 READ F

20 DATA 78

30 LET C = $5/9 * (F - 32)$

```

40 LET K = C+273 .....
50 LET R = F+460 .....
60 PRINT .....
70 PRINT F: .....
80 PRINT .....
90 PRINT C; K .....
100 PRINT .....
110 PRINT R .....
120 END

```

3. What will you type on terminal if you want to enter the given data ?

(i) 10 INPUT A,B,C1,D2

where A = 275, B= -32, C1 = 3.25×10^{-5} , D2 = $2.5E+5$

.....<CR>

(ii) 10 INPUT M1,M2

20 INPUT M3,M4

where M1 = $-7.52E+15$, M2= -100, M3 = 256.71, M4 = 205

.....<CR>

.....<CR>

(iii) 10 INPUT A1

20 INPUT B1,C1

30 INPUT D1,E1

where A1 = $5.678 E-17$, B1= .000342, C1 = -75000,

D1 = 2765.43, E1 =9251

.....<CR>

.....<CR>

.....<CR>

4. Consider the following program segments in BASIC. Show the printout if you key-in the value of X as 10 and Y as 15

(i) 10 INPUT X,Y

20 LET A = (X+Y)/2

30 PRINT "AVERAGE OF"

40 PRINT X,Y

50 PRINT "IS =", A

60 END

(ii) 10 INPUT X,Y

20 PRINT "AVERAGE OF" X,

30 PRINT Y

40 PRINT "IS="; (X+Y)/2

50 PRINT "JOB IS OVER"

60 END

(iii) 10 INPUT X

20 INPUT Y

30 PRINT "AVERAGE OF"

40 PRINT X; ", "

50 PRINT Y

60 PRINT "IS="; (X+Y)/2

70 END

5. Show how the printed output will appear in each of the following situations:—

(i) 10 PRINT "AVERAGE OF"; A; TAB(15); "AND";

.....

.....

.....

.....

.....

.....

.....

.....

.....

$D1=5.35 \times 10^4$	$E1= - 5.67 \times 10^{-6}$
$D2=-4578634.9$	$E2=0.546 \times 10^9$
$D3=0.00006843562$	$E3=546.34$
$D4=- 356$	$E4=10^{-4}$

[illegible]

- 20 PRINT D3, D4
 30 PRINT E1, E2, E3, E4
 (ii) 10 PRINT D1; D3
 20 PRINT D2; D4
 30 PRINT E1; E2; E3
 (iii) 10 PRINT D1,
 20 PRINT D2,
 30 PRINT E1,
 40 PRINT E2
 (iv) 10 PRINT E1;
 20 PRINT D1; D2
 30 PRINT E2
 40 PRINT E3; E4

7. Consider the following program:—

```
10 LET S=A
20 LET B=A
30 LET C=(A*(B+5))
40 PRINT A, B, "C=", C
50 END
```

- (i) Read this program and write it in correct form
- 10
 20
 30
 40
 50

- (ii) After the correction of the program, what value will be stored in C before line 30 has been executed?
- (iii) What value will be stored in C after line 30 has been executed?
- (iv) What will be the printout?

8. Consider the following program:—

```
10 READ A, B, C
20 10, 25, 30
30 LET S= A+B+C /2
40 LET A=S(S-A) (S-B) (S-C)↑.5
50 PRINT A
60 END
```

- (i) Read this program and write it in correct form

```
10 .....
20 .....
30 .....
40 .....
50 .....
60 .....
```

- (ii) What does this program do?
- (iii) After the program has been corrected, what will be the printout?

9. Consider the following program:—

```
10 READ A,B
20 READ C
30 LET D=(A+B+C)/3
35 RESTORE
40 READ E, F
50 READ G
55 LET H=(E+F+G)/6
60 DATA 10, 20, 30, 40, 50, 60
70 PRINT "A="; A, "B="; B, "C="; C
80 PRINT E; F; G
90 PRINT "VALUE OF D="; D, TAB (20);
100 PRINT "VALUE OF H="; H
110 END
```

- (i) What will be the value of G in
this program?
- (ii) What will be the value of G in
this program if line 35 has been
deleted?
- (iii) What will be the value of D and
H in this program?
- (iv) What will be the printout?
.....
.....
.....

10. Consider the following program :-

```
10 READ P
20 DATA 4, -1, 7, 9
30 LET R=2*(P+2)
40 RESTORE
50 READ Q
60 READ P, Q, A
70 PRINT P, Q, R, A
80 END
```

- (i) What constant will be stored in P after line 60 has been executed?
- (ii) What will be the final value stored in P if line 40 is deleted?
- (iii) What constant will be stored in R after line 30 has been executed?
- (iv) What will be the printout?

11. The length of the hypotenuse of a right triangle may be found from the formula $C = \sqrt{a^2 + b^2}$

Write a BASIC program which will read values for *a* and *b* and then compute and print *C*.

.....

.....

.....

.....

-
.....
.....
.....
12. The formula for the final amount of money invested in a financial institution at compound interest is $A = P(1+r)^t$

Write a program to calculate A where values of p , r and t may be taken in the READ statement as 400, 5 and 3 respectively.

.....
.....
.....
.....
.....
.....
.....
.....

6. CONTROL STATEMENTS

1. Each of the following is a condition that involves the use of relational operators. Identify the errors, if any, and give the correct form.

	Error	Correct form
(i) X="GOEL"	Mixed Mode not allowed	X\$="GOEL"
(ii) Y\$>50
(iii) A I\$<>P+Q
(iv) P\$="123"
(v) A\$=B\$+C\$
(vi) A\$=B+C\$
(vii) P>=P1 + P2
(viii) P/Q <= R/S
(ix) N\$="PANKAJ"
(x) A\$<B\$

2. In the following IF-THEN statements, identify the errors, if any, and give the correct form:

	Error	Correct form
(i) 10 IF A!↑4>100 THAN 100	THAN should be replaced by THEN	10 IF A!↑4>100 THEN 100
(ii) 20 IF (A+B-C)=100 THEN 60
(iii) 30 IF A+B<>C THEN k
(iv) 40 IF A>3 AND <10 THEN 200
(v) 50 IF A > 3 OR B> THEN 200
(vi) 60 IF NOT(A>3 OR B<10) THEN 60

- | | | | |
|--------|--|-------|-------|
| (vii) | 70 IF NOT (A>3 AND
B<10) THEN 200 | | |
| (viii) | 80 IF A<100, B=20 | ..... | ..... |
| (ix) | 90 IF A=5 GO TO 70 | ..... | ..... |
| (x) | 100 IF A+6>=B THEN LET
I=0 ELSE I=I+1 | | |

- | | Statement number |
|--|------------------|
| (i) 10 IF A↑3>=B THEN 60
20 | 60
..... |
| (ii) 10 IF A>3 AND B<8 THEN 40
20 | |
| (iii) 10 IF A>4 OR B<8 THEN 60
20 | |
| (iv) 10 IF NOT (A>3 OR B<10) THEN 70
20 | |
| (v) 10 IF (A*B)>= 15 THEN 90
20 | |
| (vi) 10 IF A-3<5 THEN 50 ELSE 60
..... | |
| (vii) 10 IF A>8 AND B<15 THEN 70
20 | |
| (viii) 10 IF B-A<= 5 THEN 80 ELSE 40
..... | |
| (ix) 10 IF A>3 AND B<12 THEN 70
20 | |
| (x) 10 IF A>6 OR B<=10 THEN 50
20 | |

- (i) If A has a value less than 100, then transfer control to statement 150, otherwise execute the next statement

(ii) If B is larger than or equal to 60, increase C by 1, then transfer control to statement 10; otherwise transfer the control directly to statement 10.

(iii) If X is larger than Y, assign this value to Y; otherwise continue.

(iv) If M=0 then transfer control to statement 200, otherwise add the value of M to the value of T and return to statement 30.

5 Each of the following is a statement that involves the use of ON-GO TO. Identify the errors, if any, and give the correct form:

	Error	Correct form
(i) 10 ON M1\$ GO TO 60, 70, 100	String variable not allowed	10 ON M1 GO TO 60, 70, 100
(ii) 80 GO TO 50, 100 120. 160 ON (X+Y+Z)		
(iii) 100 ON [(P+Q)/R] ↑ 3 GO TO 175, 200, 230		
(iv) 70 ON A1 GO TO 90, 25, 70, 160		
(v) 110 ON M GO TO M1, M2, M3		
(vi) 120 ON P-2 THEN 70, 75		
(vii) 130 ON K GO TO 50, 50, 70		

- (viii) 140 ON X 2 GO TO 30; 40; 50
 (ix) 150 ON k(1) GO TO 10, 40
 (x) 160 ON P GO TO 30

6. Consider the following ON-GO TO statement
 100 ON J-K GO TO 70, 90, 120, 150
 Where will the control be transferred in the
 following cases?

	Error message/ Statement number
(i) $J=-5$ and $K=-8$	120
(ii) $J=5.5$ and $K=0.75$	
(iii) $J=-5$ and $K=-6$	
(iv) $J=3$ and $K=-1$	
(v) $J=4.5$ and $K=1.2$	
(vi) $J=-1$ and $K=-2.9$	
(vii) $K=-1$ and $J=1$	
(viii) $K=-5$ and $J=-2$	
(ix) $J=0$ and $K=0$	
(x) $J= 3$ and $K= 5$	

7. Consider the following ON-GO TO statement
 100 ON A/B GO TO 30, 80, 75, 700
 Where will the control be transferred in the following cases?

	Error message/Statement number
(i) $A=8$ and $B=3$	80
(ii) $A=20$ and $B=5$	
(iii) $A=20$ and $B=-2$	
(iv) $A=10$ and $B=4$	
(v) $A=5$ and $B=0$	

- (vi) $A = -10$ and $B = -4$
- (vii) $A = -7$ and $B = -6$
- (viii) $A = -8$ and $B = 2$
- (ix) $A = -6$ and $B = -6$
- (x) $A = 0$ and $B = 2$

8. The program below illustrates the combined use of the IF-THEN and GO TO statements. The purpose of the program is to determine whether the constant stored in location X is positive, negative or Zero. The value of X is assigned in statement 10.

```

10 LET X = -5
20 IF X < 0 THEN 100
30 IF X = 0 THEN 120
40 PRINT X, "IS POSITIVE"
50 GO TO 200
100 PRINT X, "IS NEGATIVE"
120 PRINT X, "IS ZERO"
130 GO TO 200
200 END

```

(i) Give the printout of the above program.

.....

(ii) Debug the program i.e., find errors and make necessary corrections.

.....

.....

(iii) What will be the printout after the corrections are made?

.....

(iv) What would happen to the printout if the comma after X in line 100 is replaced by semi-colon?

.....

9. The program below illustrates the solution of quadratic equation.

```

10 READ A,B,C

```

```

20 5,12,7,3,20,25
25 IF A=0 THEN 10
30 D1=B↑2-4AC
40 IF D1<0 GO TO 10
50 IF D1=0 THEN 80
60 R1=(-B+ SQR (D1))/2A
70 R2=(-B-SQR (D1))/(2 * A)
75 GO TO 95
80 R1=-B/2A
90 R2=R1
95 PRINT R1, R2
100 GO TO 10
110 END

```

- (i) Debug the above program i.e. find errors and make necessary corrections:

```

20 .....
30 .....
40 .....
60 .....
80 .....

```

- (ii) What would happen to the printout if the statement 75 is deleted?

.....

- (iii) What will be the printout after the corrections are made?

.....

- iv. The program below counts separately the number of times negative, zero and positive constants appearing in a data list :

```

10 DATA 8
20 DATA 7,-6 -35, 0, 4, -25, 0, 6275
30 LET N=1
40 LET Z=0
50 LET P=0

```



```

60 LET T=0
70 READ A
80 READ B
90 IF A<0 THEN 130
100 IF B=0 THEN 150
110 LET P=1
120 GO TO 160
130 LET N=N+1
140 GO TO 160
150 LET P=P+1
160 LET T=T+1
170 IF T<A THEN 70
180 PRINT N, Z, P, T
190 END

```

- (i) Debug the above program, i.e. find errors and make necessary corrections.

```

30 .....
90 .....
110 .....
150 .....
170 .....

```

- (ii) What will be the printout after the corrections are made?

11. Write a program to determine the roots of the quadratic equation $ax^2+bx+c=0$ where the values of a , b and c may be taken from the READ statement. Further if there are no real roots, print the message "NO REAL ROOTS"; if the roots are equal, print the message "EQUAL ROOT"; if the roots are unequal, print the message "ROOT 1=" — "ROOT 2=" —

Recall that the formula to calculate the roots of a quadratic equation is :

$$x_1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a} \text{ and } x_2 = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

if $b^2 - 4ac < 0$, roots are imaginary

if $b^2 - 4ac = 0$, roots are equal

.....
.....
.....
.....
.....
.....

7. FOR—NEXT STATEMENT

1. In the following FOR statements, write the values taken by the index variable.

FOR statement	Index variable	Values
(i) 10 FOR L=3 TO 9 STEP 3	L	3,6,9
(ii) 20 FOR G=1 TO 9 STEP 2
(iii) 30 FOR A2=3 TO 8 STEP 3
(iv) 40 FOR W1=315 TO 817 STEP 200
(v) 50 FOR B6=3 TO 16 STEP 4
(vi) 60 FOR I=2 TO 6
(vii) 70 FOR L=10 TO 1 STEP-1
(viii) 80 FOR K=1 TO 5 STEP-5
(ix) 90 FOR P=10 TO 10
(x) 100 FOR R=3 TO 27 STEP 6

2. Given an index variable and its values, write an appropriate FOR statement.

	Index variable	Values	FOR statement
(i)	R	1,4,7,10	10 FOR R=1 TO 10 STEP 3
(ii)	P	18,25,32,39	.....
(iii)	K3	200,201,202,203	.....
(iv)	X	1, 1.1, 1.2, 1.3, 1.4, 1.5	.....
(v)	M1	10, 8, 6, 4, 2	.....

(vi)	L5	1, 3, 5, 7, 9, 11, 13, 15	.....
(vii)	K	10, 10.5, 11, 11.5, 12, 12.5, 13	.....
(viii)	P1	1, 6, 11, 16, 21	.....
(ix)	T1	6, 206, 406, 606, 806	.....
(x)	A	5, 4, 3, 2, 1, 0	.....

3. In the following FOR statements, identify the errors, if any, and give the correct form:

Statement	Error	Correct form
(i) 10 FOR N(J)=1 TO 100	A subscripted variable cannot be used as an index variable	10 FOR N=1 TO 100
(ii) 20 FOR L=K TO K+20 STEP 5
(iii) 30 FOR L=0 TO -10 STEP 2
(iv) 40 FOR M\$=2 TO 15
(v) 50 FOR M=M1 TO M2 STEP M
(vi) 60 FOR L=L1 TO 20 STEP L1
(vii) 70 FOR Y = K(1) TO K(2) STEP K(3)
(viii) 80 FOR K = 20 TO -20 STEP -4
(ix) 90 FOR P12 = 0 TO 25 STEP 5
(x) 100 FOR B = 10 TO 0 STEP 0.2

4. Following are some programs using *FOR-NEXT* statements. What will be the printout?

(i) 10 FOR K = 4 TO 1 STEP -1
15 PRINT K*K
20 NEXT K
25 END

.....
.....
.....
.....

(ii) 10 FOR M = 4 TO 6
15 PRINT M; M*M; M↑3
20 NEXT M
25 PRINT "PROGRAM OVER"
30 END

.....
.....
.....
.....

(iii) 10 LET A = 0; LET B = 1
20 FOR N = 1 TO 4
30 LET A = A+N
40 LET B = B*N
50 PRINT N; A; B
60 NEXT N
70 END

.....
.....
.....
.....

- 5 Two programs using IF-THEN statement are given below. Write a corresponding program using FOR-NEXT statement.

(i) 10 LET I = 1

20 IF I > 10 THEN 60

30 PRINT I * I

40 LET I = I + 1

50 GO TO 20

60 END

(ii) 10 PRINT "N", "N1", "N2", "N3"

20 LET N = 1

30 LET N1 = N * N

35 LET N2 = N * N * N

40 LET N3 = 1/N

50 PRINT N, N1, N2, N3

60 IF N >= 10 THEN 100

70 LET N = N + 1

80 GO TO 30

100 END

6. What will be the printout in the following two programs?

(i) 10 FOR M = 1 TO 5

20 IF M = 4 THEN 50

30 PRINT "M"; M

40 NEXT M

50 END

(ii)	10 DATA 3, 4, 10, 5, 6, 8, 4	.....
	20 READ A	.....
	30 FOR I=1 TO A	.....
	40 READ B, C	.....
	50 PRINT B; B+C; (B-C)^2	.....
	60 NEXT I	.....
	70 END	.....

7. In the following program segments, find the errors, if any, and give the correct form:—

	Error	Correct form
(i) 10 FOR I=1 TO 10 20 FOR I=1 TO 6 30 PRINT I 40 NEXT I	nested loops may not use the same Index variable	10 FOR I=1 TO 10 20 FOR J=1 TO 6 30 PRINT I 40 NEXT J 50 NEXT I
(ii) 10 FOR K=K TO 5 20 30 40 NEXT K		..... ..... .....
(iii) 10 FOR K+1=1 TO 10 20 30 40 NEXT K		..... ..... .....
(iv) 10 FOR I=1 TO 10 20 LET I=I*I 30 PRINT I 40 NEXT J		..... ..... ..... .....

(v) 10 FOR K=2 TO 10 STEP 1.....

20 PRINT K

30 PRINT K*K

40 NEXT K

8. Write a program to calculate and print the sum in each of the following situation:—

(i) $1+3+5+7+\dots+225$

.....
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.....

(ii) $1^2+2^2+3^2+4^2+\dots+100^2$

.....
.....
.....
.....

(iii) $1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\dots+\frac{1}{100}$

.....
.....
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.....

9. Consider the following program which computes $5!$ (Factorial 5):

```
10 LET M=1
20 FOR K=2 TO 5
30 LET M=M*K
50 NEXT K
55 PRINT "VALUE OF 5!"; M
60 END
```

(a) What will be the printout ?

(b) What will be the printout if we
replace line 20 by
20 FOR K=1 TO 5 STEP 2

(c) What will be the printout if we
replace line 20 by
20 FOR K=3 TO 1 STEP -1

(d) Change this program so that it
reads an integer from console and
prints its factorial.

10. The following program finds whether a number given through console is in the given list or not. Make corrections in the program.

```
10 DATA 5, 6, 7, 11, -40, -50, 12 15, 17, -30
20 INPUT A
30 FOR I=1, 10
40 READ B
50 IF A=B THEN 100
60 NEXT I
70 GO TO 160
100 PRINT A, "IS NOT IN THE LIST"
110 GO TO 200
160 PRINT A, "IS IN THE LIST"
170 RESTORE
180 GO TO 20
200 END
```

(i) Find the errors in the above program and correct them.

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.....

(ii) What happens if the number given through console is not in the list?

.....

.....

.....

11. For a class of 50 students, write a program to read roll number and marks obtained by each student in five subjects and print out a list in the following form:

Sr. No.	Roll number	Total marks
1
2

50

12. Write a program to print out the largest number in any list of numbers given by the DATA statement. Test your program with the following list of numbers:—
10, 20, 5, 15, 12, 30, 7, 11, 36, 6, 17, 22.

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8. SUBSCRIPTED VARIABLES

1. Write the correct form of the following Subscripted variables.

Subscripted variable	Correct form
(i) A23 (5)	A (5)
(ii) B(8,9.)
(iii) C(10;)
(iv) D(.6,5)
(v) P(2..T, S)
(vi) C(D, E(4))
(vii) L(10
(viii) A, (25)
(xi) H(0)
(x) P(2, 5.)

2. How many different combinations of Index values are possible for the following arrays?

	No. of Combinations
(i) DIM P(2,3)	6
(ii) DIM LI(4,7)
(iii) DIM AIS (10)
(iv) DIM CS (5,5)
(v) DIM A7 (7,4)
(vi) DIM K(20)
(vii) DIM A5\$ (10,3)
(viii) DIM K2(5,6)

- (ix) DIM T25 (20,3)
- (x) DIM C(25)

3. Each statement makes a reference to one or more subscripted variables. Describe the type of array referred to in each case.(numeric or string, list or table).

Statement	Type of array
(i) 10 DIM A (50), BS (10,3)	A is a numeric list, BS is a string table
(ii) 20 LET P (J)=P (J)+5
(iii) 30 IF K\$ (6)=P\$ THEN 200
(iv) 40 ON A (I,J) GO TO 100,200,300
(v) 50 PRINT P\$ (L), N2 (J)
(vi) 60 IF K (M1, M2)<10 THEN 100
(vii) 70 LET N\$ (1)= "PANKAJ"
(viii) 80 DIM C\$ (7,3), D(4)
(ix) 90 READ A (2),B, C\$ (5)
(x) 100 INPUT "NAME", NIS(1)

4. (a) Give the Contents of the list A after the execution of the program:—

10 DIM A(25)	A(1)	
20 DATA 6, 5, 7, 9, 12, 15, 25	A(2)	
30 READ N	A(3)	
40 FOR L=1 TO N	A(4)	
50 READ A(L)	A(5)	
60 NEXT L	A(6)	
70 END	A(7)	
	A(8)	

4. (b) Give the contents of the array A(4, 2) after the execution of the program :—

10 DIM A(4, 2)

A(1,1)

20 DATA 12, 17, 15, 20, 6, 11, 22, 30

A(1,2)

30 FOR I=1 TO 4

A(2,1)

40 FOR J=1 TO 2

A(2,2)

50 READ A (I,J)

A(3,1)

60 NEXT J

A(3,2)

70 NEXT I

A(4,1)

80 END

A(4,2)

5. Write program segments for the following:—

- (i) Assign the values -5.2E-7, 10, 5, DELHI, CITY to the arrays A(3) and NS(2)

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.....

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.....

- (ii) Assign the values 10, 20, 30, 40, 50 to the array A(5) using a FOR-NEXT loop.

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- (iii) Using the statement

DATA 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 assign the values alternatively to elements of two arrays i.e. A(5) and B(5)

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6. For a two-dimensional array A(3,3), write a program to do the following:

- (i) Print the values of the three diagonal elements.
- (ii) Print the sum of the values of all the elements in the array.
- (iii) Print the sum of elements in the second row and the first column respectively.

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7. What will be the printout in the following programs?

(i) 10 DIM X(10)
20 FOR K=1 TO 10
30 LET X(K)=K*K
40 PRINT X(K);
50 PRINT X(K),
60 NEXT K
70 END

.....

.....

.....

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.....

.....

(ii) 10 DIM X(10), Y(10)

20 FOR K=1 TO 10

30 LET X(K)=5*K

40 LET Y(K)=5*(11-K)

50 PRINT X(K); Y(K).

60 NEXT K

70 END

8. What will be the printout in the following program?

10 DIM X(5,5), Y(5,5)

20 FOR I=1 TO 5

30 FOR J=1 TO 5

40 X(I,J)=5*I+J

50 NEXT J

60 PRINT X(1,1); X(1,2); X(1,3);

65 PRINT X(1,4); X(1,5)

70 NEXT I

80 FOR I=1 TO 5

90 FOR J=1 TO 5

100 LET Y(I,J)=X(J,I)

110 NEXT J

120 PRINT Y(1,1); Y(1,2); Y(1,3);

125 PRINT Y(1,4); Y(1,5)

130 NEXT I

140 END

9. Write program segments for the following:

(i) Print the sum of first 100 elements of the numeric list A (200).

```
.....
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.....
```

(ii) Print the last fifty even-numbered elements of the numeric list A (200).

```
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```

(iii) Using arrays A (50, 50) and B (50), calculate the sum of row 1 of array A and store it in B (1), sum of row 2 in B (2) and so on, upto row 50.

```
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```


10. (a) Fill in the blanks in the program given below, which is required to calculate and print the number of votes received by each candidate

```
10 DIM C(2)

20 DATA 1, 1, 2, 1, 2, 1, 1, 1, 2, 1, 2, 1, 99

30 LET C(1)=.....

40 READ .....

50 IF X=99 THEN 100

60 IF X=1 THEN LET C(1)=.....

70 ..... THEN .....

80 GO TO 40

100 PRINT "CANDIDATE", "NUMBER OF VOTES"

110 PRINT "1", .....

120 PRINT ..... , C(2)

130 END
```

10. (b) Combine the statements 60 and 70 into one statement without using IF ~ THEN statement.

.....

11. Two matrices A and B are given below. Write a program to find the product of these matrices giving third matrix C.

Matrix A

10	15	20
30	40	50
15	20	45

Matrix B

2	3	4
7	5	2
6	4	1

12. Given a list of numbers 7, 17, 5, -4, 10, 15, 0, 6, 11 and 9. Write a program to arrange them in ascending order. The printout should be in the following format:

ORIGINAL LIST OF NUMBERS:

7, 17, 5, -4, 10, 15, 0, 6, 11, 9

ORDERED LIST OF NUMBERS:

-4, 0, 5, 6, 7, 9, 10, 11, 15, 17

9. STRING DATA MANIPULATION

1. Consider the following program segments in BASIC and show the printout.

(i) 5 DIM N\$(5)

10 DATA "PANKAJ", "A GOOD STUDENT"

20 DATA "RESIDENT", "OF", "YAMNUNA VIHAR"

30 FOR J=1 To 5

40 READ N\$(J)

50 NEXT J

60 PRINT N\$(1)

70 PRINT N\$(2)

80 END

(ii) 5 DIM N\$(9)

10 DATA "PANKAJ", "KUMAR", "A"

20 DATA "GOOD BOY", "C-BLOCK", "Y. VIHAR"

30 DATA "DELHI-", "53"

40 FOR J=1 TO 8

50 READ N\$(J)

60 NEXT J

70 N\$(9)=N\$(7)+N\$(8)

80 PRINT N\$(1); N\$(2)

90 PRINT N\$(5); N\$(6)

100 PRINT N\$(9)

110 END

2. Consider the following program segments in BASIC. Show the printout if you key-in the value of N1\$ as *RAM* and N2\$ as *SHYAM*

(i) 10 INPUT N1\$, N2\$
20 PRINT "HELLO"; N1\$;
30 PRINT "HOW ARE YOU?"
40 PRINT "QUITE WELL";
50 PRINT "SAID"; N2\$
60 END

(ii) 10 PRINT "KEY IN
FIRST NAME"
20 INPUT N1\$
30 PRINT "WHERE ARE
YOU GOING?";
40 PRINT N1\$
50 PRINT "KEY IN
SECOND NAME"
60 INPUT N2\$
70 PRINT "I AM GOING
TO SCHOOL";
80 PRINT "REPLIED"; N2\$
90 END

3. What will you type on terminal if you want to enter the given data?

(i) 10 INPUT N1\$, N2\$, N3\$, N4\$
Where N1\$=MY; N2\$= NAME
N3\$=IS; N4\$=PANKAJ

.....<CR>

(ii) 10 INPUT N1\$, N2\$

20 INPUT N3\$, N4\$

Where N1\$=I WAS; N2\$=BORN ON
N3\$=DECEMBER 5 ; N4\$=1942

.....<CR>

.....<CR>

(iii) 10 INPUT N1\$,N2\$

20 INPUT N3\$, N4\$

30 INPUT N5\$, N6\$

Where N1\$=BASIC STANDS FOR

N2\$=BEGINNER'S; N3\$=ALL-PURPOSE

N4\$=SYMBOLIC; N5\$=INSTRUCTION

N6\$=CODE

.....<CR>

.....<CR>

.....<CR>

4. Show how the printed output will appear in each of the following situation :

(i) 10 PRINT "MY NAME IS"; N1\$; TAB (25); "I LIVE IN"; N2\$

20 PRINT N3\$; TAB(16); "MOHAN"

Where N1\$=SOHAN; N2\$=DELHI; N3\$=WHAT ABOUT YOU ,

.....

.....

.....

.....

(ii) 10 PRINT "HELLO!"; TAB (3); A\$

Where A\$=PROFESSOR,

.....

.....

.....

(iii) 10 PRINT "HELLO!"; TAB (10); A\$
Where A\$=DOCTOR

5. Using A\$= MY , B\$= YOUR , C\$= NAME , D\$= SIR and P\$= PRINCIPAL , give the printout in each of the following :

(i) 10 PRINT "IS"; B\$; C\$; "PANKAJ"

20 PRINT "NO"; D\$

30 PRINT "IS"; B\$; C\$; "BOBY"

40 PRINT "YES"; D\$

(ii) 10 PRINT "WHAT IS";

20 PRINT B\$; C\$

30 PRINT A\$; C\$; "IS";

40 PRINT "HIMANSHU"

(iii) 10 PRINT "WHO IS";

20 PRINT B\$; P\$

30 PRINT "DR VBA";

40 PRINT "IS OUR"; P\$

6. Fill in blanks in the program below which is required to read a list of student names and their test marks, store them and print them in reverse order.

10 DIM N\$ (15), M(15)

20 FOR I=1 TO 5

30 READ N\$(—),

```

40 .....
50 FOR I=..... TO .....STEP .....
60 PRINT NS(I), .....
70 NEXT .....
80 DATA "PANKAJ", 78, "RAJU", 56, "SHOBHA", 72, "SUMAN", 50
90 DATA "DINESH", 72
100 END

```

7. Write down the greater in each of the following pairs:

- | | |
|------------------------------------|-------|
| (i) "AND" and "NAND" | NAND |
| (ii) "RAM" and "REM" | ..... |
| (iii) "X12" and "X21" | ..... |
| (iv) "ABB" and "ABC" | ..... |
| (v) "ABD" and "ABCA" | ..... |
| (vi) "ABC" and "ABC B" | ..... |
| (vii) "AB1" and "ABC" | ..... |
| (viii) "12" and "12" | ..... |
| (ix) "XX1" and "1YY" | ..... |
| (x) "123" and "XYZ" | ..... |

8. Following statements are written incorrectly. Identify the errors and give the correct form:

Statement	Error	Correct form
(i) PRINT ASC (68)	Argument must be a single character	PRINT ASC(D)
(ii) PRINT ASC (NS)	.....	.....
(iii) PRINT CHR\$ (A\$)	.....	.....
(iv) PRINT CHR\$ (A\$+X)	.....	.....

- (v) CHANGE "NAME" TO "N"
- (vi) PRINT CHR (72)
- (vii) PRINT ASC\$ (M)
- (viii) PRINT LEN (X)
- (ix) PRINT LEN\$ (N)
- (x) CHANG N\$ TO A

9. What will be the *printout* in each of the following situations:

(i) 10 LET A=ASC(N)
 20 PRINT A
 30 PRINT ASC (L)
 40 END

(ii) 10 FOR I=65 TO 70
 20 PRINT CHR\$ (I);
 30 NEXT I

(iii) 10 LET A\$="COMPUTER"
 20 DIM B(16)
 30 CHANGE A\$ TO B
 40 FOR I=1 TO 8
 50 PRINT B(I);
 60 NEXT I
 70 END

(iv) 10 LET A\$="DELHI UNIVERSITY"
 20 PRINT LEN (A\$)
 30 END

Consider the following program in BASIC. Show the printout if you key-in the value of ES as "EXECUTIVE DIRECTOR", AS as "AIM4" and MS as "MANAGEMENT"

```
10 INPUT ES, AS, MS
20 PRINT "TO"
30 PRINT TAB (6); "THE"; ES; ","
40 PRINT TAB (6); AS; ","
50 PRINT TAB (6); MS; "HOUSE."
60 PRINT TAB (6); "LODHI ROAD, INSTITUTIONAL AREA."
70 PRINT TAB (6); "NEW DELHI-110003."
80 PRINT "SIR,"
90 PRINT TAB (6); "I AM HAPPY TO TAKE ADMISSION IN P.G.
  DIPLOMA IN"; MS; "."
100 PRINT "REALLY SPEAKING,"; AS; "IS A WELL REPUTED";
  MS; "ORGANISATION"
110 PRINT "WHICH IS DOING ITS DUTY IN A RIGHT
  DIRECTION."
120 PRINT TAB (6); "THE WHOLE CREDIT GOES TO ITS"; ES;
  "UNDER WHOSE"
130 PRINT "GUIDANCE"; AS; "IS ADVANCING FAST TO
  ACHIEVE ITS AIM."
140 PRINT TAB (45); "SINCERELY YOURS."
150 PRINT
160 PRINT TAB (45); "(PANKAJ)"
```

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11. Dr. VBA, Professor of Computer Science, has assigned a final grade to each of his students. He wishes to prepare a list of his students sorted alphabetically by name in ascending order with their respective final grades. Names and corresponding grades are recorded in DATA statement as "RAJU", 95, "PANKAJ", 98, "BOBY", 92, "WANCHU", 85, "ANNU", 75, "END", 0 where "END" in the DATA statement shows the end of the list. How will you write a program if this job is assigned to you?

12. Each pair of data entries gives an item and its list price.

DATA "SOFA", 300, "CHAIR", 60

DATA "RADIO", 600, "TELEVISION", 4000.

A store is holding a 20% discount sale. The sales-tax is charged at 10% of the sale price. Write a program which gives the following printout for 20 items:

<i>ITEM</i>	<i>LIST PRICE</i>	<i>SALE PRICE</i>	<i>SALES TAX</i>	<i>TOTAL PRICE</i>
SOFA
CHAIR
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
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.....
.....

10 FUNCTIONS AND SUBROUTINES

1. Write down *TRUE* or *FALSE* for each of the following:

- (i) Functions make use of dummy arguments; subroutines do not. (T/F)
- (ii) Functions and subroutines can help avoid duplication of programming effort. (T/F)
- (iii) The **RETURN** statement is used in functions but not in subroutines (T/F)
- (iv) Subroutines can be called only through the **GO TO** statement (T/F)
- (v) The variables used in subroutine must be defined in the main program before calling them. (T/F)
- (vi) Certain **BASIC** statements cannot be used in a subroutine. (T/F)
- (vii) Most **BASIC** systems contain two types of functions, built-in functions and user-defined functions. (T/F)
- (viii) The **RETURN** statement causes control to return to a statement in the program which follows a **GO SUB** statement. (T/F)
- (ix) Subroutines may have only one entry point. (T/F)
- (x) Subroutines can be anywhere in the program but usually are grouped together and put at the end just before the **END** statement. (T/F)

2. Write a BASIC function to evaluate each of the following algebraic formulas.

- | | |
|--|-----------------------|
| (i) $m = a n^b$ | DEF FNM (A,B,N)=A*N↑B |
| (ii) $y = a_0 + a_1 x + a_2 x^2 + a_3 x^3$ | ..... |
| (iii) $l = (m+n)^m - n$ | ..... |
| (iv) $t = (\frac{b}{o}) + (\frac{r}{s})$ | |
| (v) $a = x^3 + 2x^2 - 3x + 4$ | |

3. What value will be assigned to P by each of the following statements?

Value of P

- | | |
|--------------------------------|-------|
| (i) 10 LET P=SGN (-4.3) | -1 |
| (ii) 20 LET P=INT (-4.2) | ..... |
| (iii) 30 LET P=ABS (-4.2) | ..... |
| (iv) 40 LET P=INT (SGN (-4.2)) | ..... |
| (v) 50 LET P=SQR (4) | ..... |

4. Identify the errors in the following statements which contain a function definition and/or function reference.

Error

- | | |
|--|--|
| (i) 10 DEF FNA (K,L,M↑3,4)=((K-L)*M↑2)/4 | Constants and formulas cannot be used as dummy arguments |
| (ii) 10 DEF FNC (K,L,M)=((K-L)/L)↑M | ..... |
| 60=LET P=C*FNC (2*A, F\$) | ..... |
| (iii) 10 DEF FNK (A(1), A(2), A(3))= | ..... |
| A(1)*A(2)/A(3) | ..... |
| | |

- (iv) 10 DEF FN3 (A,B,C)=A↑2+B↑2+C↑2

 (v) 10 DEF FNP (A,B,C)

 50 LET L=N+FNP (D,E,F)

5. What will be the printout of the following program?

(i) 10 DEF FNB(X)=X↑2+1 **Printout**
 20 DEF FNG(X)=X↑3+2*X+1
 30 PRINT FNB(3)
 40 PRINT FNG(2)
 50 PRINT FNB(4)
 60 END

(ii) 10 DATA 3,5
 20 READ M, N
 30 DEF FNG(R)=2*M+R+N
 40 PRINT FNG(7), FNG(10)
 50 END

(iii) 10 FOR K=1 TO 4
 20 GO SUB 50
 30 NEXT K
 40 GO TO 70
 50 PRINT K,
 60 RETURN
 70 END

6. Complete line 10,30 and 50 of the following program that will print the following table of values for $p(x) = x^2 + 1$ in steps of .5

X	Y
1	2
1.5	3.25
2	5
2.5	7.25
3	10

Complete the following
lines

```

10 PRINT ..... 10 .....
30 DEF FNP ( ) ..... 30 .....
40 FOR X=1 TO 3 STEP .5
50 PRINT ..... 50 .....
60 NEXT X
70 END

```

7. Consider the following program which simulates tossing a coin 50 times. A head is represented by 1 and a tail by 2. The number of occurrences of heads and tails is stored in A(1) and A(2) respectively.

```

10 DIM A(2)
20 LET A(1)=0
30 LET A(2)=0
40 FOR M=1 TO 50
50 LET L=INT(RND(X)+1.5)
60 LET A(L)=A(L)+1
70 NEXT M
80 PRINT A(1), A(2)
90 END

```

- (i) What are the possible values
of the constant assigned to L in
the statement 50

(ii) What is the relationship between
the value of M, A(1) and A(2)
each time when statement 70
is executed

(iii) Add statements to this
program so that it will
simulate twenty people
each tossing a coin 50
times.

8. *The following groups of statements represent portions of BASIC programs that contain functions or subroutines. Each example contains one or more errors. Identify the errors and give the correct form.*

	Error	Correct form
(i) 40 GO SUB 160	(i) Control cannot	40 GO SUB 160
80	be transfered	.....
160 LET A A1 A2 A3	out of a subroutine	160 LET A=A1+A2+A3
.....	by means of a	.....
180 GO TO 80	GOTO statement	180 GO TO 220
.....		220
230 RETURN	(ii) A subroutine	230 RETURN
240 FN END	cannot end with	250 END
250 END	an FNEND statement	.....

(ii) 50 GO SUB 210
.....
.....
120 IF A<B THEN 230
200 LET P= Q-R
.....
.....
230 A=A+1
240 RETURN

9. What are the differences between a function and a subroutine? Describe them briefly (4 lines)

FUNCTION	SUBROUTINE
1.
2.
3.
4.

10. Write down the names of 10 standard built-in functions which are commonly used in **BASIC**.

FUNCTION	DESCRIPTION	FUNCTION	DESCRIPTION
(i) SIN (x)	SINE of x	(vi)	
(ii)		(vii)	
(iii)		(viii)	
(iv)		(ix)	
(v)		(x)	

11. Using the function:

$$Y(p) = 1 + p + \frac{p^2}{2} + \frac{p^3}{6}$$

write a program to compute and print $5 + Y(p) + 2Y(p)^2$ and $5 - Y(p) - 2Y(p)^2$ for $p=1, 2, 3, 4$, and 5 .

.....

.....

.....

.....

12. The factorial of a number m is defined as

$$m! = m \times (m-1) \times (m-2) \dots 4 \times 3 \times 2 \times 1.$$

Write a program which reads n , r and computes

$$\frac{n!}{r! \times (n-r)!} . \quad (\text{Use subroutines for the purpose})$$

11. MATRIX OPERATIONS

1. State TRUE or FALSE for each of the following sentence:

- (i) Unlike other languages, BASIC has a powerful matrix command called MAT. (T/F)
- (ii) Matrix inversion is often used in solving linear simultaneous equation. (T/F)
- (iii) Transpose of a matrix means changing the sign of all its elements from positive to negative and vice-versa. (T/F)
- (iv) "Vector" and "Matrix" are mathematical terms that refer to a list and a table respectively. (T/F)
- (v) Two matrices can be multiplied if the number of rows in the first matrix is equal to the number of columns in the second matrix. (T/F)
- (vi) A matrix is a rectangular array of numbers. (T/F)
- (vii) When all the elements of a matrix are zero, it is called a constant (T/F)
- (viii) When all the diagonal elements of a square matrix are unity, it is called an identity matrix. (T/F)
- (ix) Two matrices, X and Y, are said to be equal, if all the elements at the corresponding places of matrix are same. (T/F)
- (x) When all the elements of a square matrix are equal, the matrix is called a scalar matrix. (T/F)

2. Given that A, B, C are two-dimensional arrays, explain the functions of the following statements:

FUNCTION

(i) **MAT READ A** : reads all elements of A matrix row-wise from DATA statement

(ii) **MAT INPUT B**

.....

(iii) **MAT PRINT C**

.....

(iv) **MAT A = ZER**

.....

(v) **MAT B = CON**

.....

(vi) **MAT C = IDN**

.....

(vii) **MAT A = B+C**

.....

(viii) **MAT A = B**

.....

(ix) **MAT A = B*C**

.....

(x) **MAT A = INV (B)**

.....

.....

3. For the given program write down elements in Matrix C and Matrix D and also give the printout of the program.

10 DIM A(3,3), B(3,3)

20 DIM C(3,3), D(3,3)

30 MAT READ A,B

40 MAT C = A+B

50 MAT D = 2*A-B

60 MAT PRINT C, D,

70 DATA 10,7,6,5,9,1

80 DATA 13,15,6,5,3,8

90 DATA 5,4,3,7,9,17

(i) Write down the elements in Matrix C

(ii) Write down the elements in Matrix D

(iii) What will be the printout after the program is executed ?

.....

.....

.....

.....

4. The given program is required to calculate the product of two matrices:

```
10 DIM A(3,3), B(3,3), C(3,3)
20 READ A,B
30 FOR I = 1 TO _____
35 FOR ____ = 1 TO 3
40 LET C(I,J) = _____
50 FOR K = 1 TO 3
60 LET C(I,J) = _____A(____,K) * B (K,J)
70 NEXT K
80 NEXT _____
90 NEXT I
100 DATA .....
110 DATA .....
120 END
```

- (i) Fill in the blanks in the above program.
- (ii) Write an equivalent MAT command to
perform matrix multiplication.
.....
- (iii) Under what condition, can two matrices
be multiplied?
.....

5. Several BASIC statements are shown below. Identify the errors, if any, and give the correct form.

	Error	Correct form
(i) 10 MAT PRINT A,B, A+B, A-B

(ii) 10 DIM A(3,5), B(8,9), C(4,4)
:		
40 MAT C = A+B
(iii) 10 DIM M(5,7), N(5,7), K(10)
:		
60 MAT N = INV (C)
:		
80 MAT K = IDN
(iv) 10 DIM A(5,5), B(5,5)
:		
60 MAT B = A*B
(v) 10 DIM A(200)
:		
60 MAT INPUT A(100)

6. Write BASIC statements for each of the problems given below:

- (i) Evaluate the formula

$Y = X^T \times A \times X$, where A is a 5×5 matrix, X is a 5-element vector and X^T is the transpose of X.

.....

.....

.....

.....

.....

(ii) Evaluate the formula

$P = (N) * A^{-1} * B + C$, where A, B and C are 10×10 matrices, N is an ordinary scalar variable and A^{-1} represents the inverse of A.

.....

7. Two program segments using FOR-NEXT statements are given below. Write a corresponding program segment using MAT statements.

*Array operations using
FOR-NEXT statement*

*Array operations using
MAT statements*

(i) 10 DIM A(3,4)	.....
20 DIM B(3,4)	.....
30 FOR I = 1 TO 3	.....
40 FOR J = 1 TO 4	.....
50 READ A(I,J)	.....
60 PRINT A(I,J)	.....
70 NEXT J	.....
80 NEXT I	.....
90 FOR I = 1 TO 3	.....
100 FOR J = 1 TO 4	.....
110 READ B(I,J)	.....
120 PRINT B(I,J)	.....
130 NEXT J	.....
140 NEXT I	.....

150 DATA 4,5,6,7	.....
160 DATA 10,11,12,13	.....
170 DATA 20,25,30,35	.....
180 DATA 4,8,12,16	.....
190 DATA 9,11,13,15	.....
200 DATA 20,21,22,23	.....
210 END	.....
(ii) 10 DIM L(3,4), F(3,4)	.....
20 FOR I = 1 TO 3	.....
30 FOR J = 1 TO 4	.....
40 LET L(I,J) = F(I,J) - I * F(I,J)	.....
50 PRINT L(I,J);	.....
60 NEXT J	.....
70 NEXT I	.....
80 END	.....

8. What will be the printout in the following programs?

(i) 10 DIM A(3,3)	.....
20 MAT READ A	.....
30 PRINT A(2,1)	.....
40 PRINT A(2,2)	.....
50 PRINT A(1,1)	.....

60 DATA 5,5,1,7,8,9,2,2,2	.....
70 END	.....
(ii) 10 DIM P(4,2)	.....
20 MAT READ P	.....
30 PRINT P(2,1)	.....
40 PRINT P(3,2)	.....
50 PRINT P(2,1) + P(3,2)	.....
60 DATA 5,1,7,7,8,13,0, -2	.....
70 END	.....

9. What will be the printout in the following programs?

(i) 10 DIM P(10,10) K(5,5)	.....
20 READ E,F	.....
30 MAT P=IDN (E-2, F)	.....
40 MAT K=CON(E,F)	.....
50 MAT PRINT P,K	.....
60 MAT PRINT P;K	.....
70 DATA 5,3	.....
80 END	.....
(ii) 10 DIM A(5,3), S(3)	.....
20 MAT READ A	.....
30 PRINT "GAME", "PT. TOTAL"	.....
40 FOR C=1 TO 3	.....
50 LET S(C)=0	.....
60 FOR R = 1 TO 5	.....
70 LET S(C)=S(C)+A (R,C)	.....

```

80 NEXT R
90 PRINT C, S(C)
100 NEXT C
110 DATA 16, 20, 22
120 DATA 10,15,20
130 DATA 7,6,9
140 DATA 13,16,18
150 DATA 9, 13, 15
160 END

```

10. A company produces 10 types of products, its production for a year and cost of each product is given below :

Type of product	1	2	3	4	5	6	7	8	9	10
Product produced	75	80	100	120	75	52	43	78	102	125
Cost of each product	400	520	650	375	455	700	690	720	560	820

Fill in the blanks in the program given below, which is required to calculate and print the total cost of the products produced during the year :

```

10 DIM A(1,1), B(1,10), C(10,1)
20 MAT READ .....
30 MAT READ .....
40 MAT ..... = B* .....
50 DATA.....
.....
60 DATA 400, 520,.....
.....
70 MAT ..... A
80 END

```


12. BASIC PROGRAMMING ASSIGNMENT

ASSIGNMENT 1

Instructions :

A list of the temperature readings for the day in Fahrenheit and Celsius is to be prepared. A program should be designed and coded in BASIC to produce the report.

Input :

Input consists of a series of temperature readings taken every six hours. The input consists of the reading number, the time of the day, and the Fahrenheit temperature. Reading number 9 should be used as the end of file indicator.

<i>Reading</i>	<i>Time</i>	<i>Fahrenheit Temperature</i>
1	2.00 A.M.	32
2	8.00 A.M.	50
3	2.00 P.M.	68
4	8.00 P.M.	59
9	END	99

Output :

Output is a daily temperature report listing the time of the temperature reading, the Fahrenheit temperature, and the Celsius temperature. The Celsius temperature is obtained by the following formula :

After all records have been processed, the average temperature for the day is to be displayed. The format of the output is illustrated below:

<i>TEMPERATURE</i>		
<i>TIME</i>	<i>FAHRENHEIT</i>	<i>CELSIUS</i>
2.00 A.M.	32	0
8.00 A.M.	50	10
2.00 P.M.	68	20
8.00 P.M.	59	15
AVERAGE FAHRENHEIT	52.25	
AVERAGE CELSIUS	11.25	

ASSIGNMENT 2

Instructions :

A report of the book royalties for authors is to be prepared. A program should be designed and coded in BASIC to produce the report.

Input :

Input consists of sales records that contain the author's name, the title of the book, and the number of books sold. The input data is shown below. The name "END OF FILE" should be used as the end of file indicator.

<i>Name</i>	<i>Title</i>	<i>Number sold</i>
PANKAJ	BASIC	3999
RAJARAMAN	FORTTRAN	5678
HASSAN	COBOL	4390
SHARMA	PASCAL	3897
AGGARWAL	PLI	4960
END OF FILE	END	9999

Output :

Output is a book royalty report containing the author's name, the title of the book, the number of copies sold, and the royalty. If a book sells less than 4,000 copies, a royalty of Rs. 2.00 per book is paid. If a book sells 4,000 copies or more, a royalty of Rs. 2.50 per book is paid. After all records have been processed, the total number of authors, the total number of books sold and the

total royalties paid to all authors are to be displayed. The format of the output is illustrated below :

BOOK ROYALTIES			
<i>Name</i>	<i>Title</i>	<i>Sold</i>	<i>Due</i>
PANKAJ	BASIC	3999	.....
RAJARAMAN	FORTRAN	5678	.....
HASSAN	COBOL	4390	.....
SHARMA	PASCAL	3897	.....
AGGARWAL	PLI	4960	.....
TOTAL AUTHORS = 5			
TOTAL BOOKS =			
TOTAL ROYALTIES =			

ASSIGNMENT 3

Instructions :

A grade report is to be prepared for the students in a class. A program should be designed and coded in BASIC to produce the report.

Input :

Input consists of records containing the student roll number, student name, and marks secured in three tests. The input data is shown below. Student roll number 999 should be used as the end of file indicator.

<i>Student Roll No.</i>	<i>Student Name</i>	<i>Test-1</i>	<i>Test-2</i>	<i>Test-3</i>
020	PANKAJ	88	96	92
156	SHOBHA	70	65	75
320	DINESH	90	40	47
460	RAJESH	88	60	59
795	SUMAN	89	79	72
805	HARIOM	70	70	85
910	BIMALA	50	60	70
935	KRISHNA	90	80	70
999	END	99	99	99

Output :

Output is a grade report containing the report title, the class title, and the Professor's name. The class title for this report is SYSTEM ANALYSIS AND DATA PROCESSING and the Professor's name is AGGARWAL. The report should also contain the student roll number, student name, average grade (The marks from test-1, test-2 and test-3 added together and divided by 3), and the letter grade based upon the average numeric grade. The letter grade is obtained as follows:

Grade A : 90%-100%; Grade B : 80%-89%; Grade C : 70%-79%; Grade D : 60%-69%; Grade F : Below 60%. After all records have been processed, the total number of students and the total number of A,B,C,D and F grades are to be displayed. The format of the output is given below :

GRADE REPORT SYSTEM ANALYSIS AND DATA PROCESSING PROF. AGGARWAL

<i>Student Roll No.</i>	<i>Student Name</i>	<i>Average Marks Secured</i>	<i>Class Grade</i>
020	PANKAJ	92	A
156	SHOBHA	70	C
320	DINESH	59	F
460	RAJESH	69	D
795	SUMAN	80	B
805	HARIOM	75	C
910	BIMALA	60	D
935	KRISHNA	80	B
999	END		

TOTAL STUDENTS = 8
TOTAL A's = 1
TOTAL B's = 2
TOTAL C's = 2
TOTAL D's = 2
TOTAL F's = 1

ASSIGNMENT 4

Instructions :

A report of book sales is to be prepared. Design and code a program in BASIC to produce the report.

Input :

Input consists of book sales records that contain a salesperson's number, the college name, the book title, and the total sales to the college. The records are sorted in book title within salesperson number sequence. The salesperson number 9999 should be used as the end of file indicator.

<i>Salesperson</i>	<i>College</i>	<i>Title</i>	<i>Total sold</i>
2464	RAMJAS	BASIC	145
2464	HINDU	BASIC	200
2464	RAMJAS	COBOL	300
2500	NEHRU	COBOL	250
2500	DAULAT RAM	PASCAL	220
2500	KALINDI	PASCAL	400
2510	VAISH	PLI	500
2510	SATYAWATI	PLI	270

Output :

Output is a book sales summary report that lists the salesperson's number, the book title, and the total sales for that book. The report is to be group printed; that is, one line is to be displayed for each group of records related to a given book title. When the salesperson number changes, the total number of books sold by that salesperson is to be displayed. After all records have been processed, the total number of all books sold by all sales people is to be displayed. The format of the output is given below.

BOOK SALES SUMMARY		
Sales Person	Title	Total Sold
2464	BASIC	345
2464	COBOL	300
	TOTAL BOOKS	645
2500	COBOL	250
2500	PASCAL	620
	TOTAL BOOKS	870
2510	PLI	770
	TOTAL BOOKS	770
TOTAL BOOKS SOLD= 2855		

ASSIGNMENT 5

Instructions :

A student class list is to be prepared. A program should be designed and coded in BASIC to produce the list.

Input :

Input consists of student registration records that contain the student number, the student name, and a code indicating the class in which the student is enrolled. The input data and a table containing a class code, a related class description, and the number of units for the class are illustrated below. The student number 99999 should be used as the end of file indicators.

INPUT			TABLE		
Student number	Student name	Class code	Class code	Class description	Units
10000	PANKAJ	05	05	ART	2
20000	SUMAN	13	07	SCIENCE	2
30000	SHOBHA	17	08	COMMERCE	4
40000	DINESH	12	12	LAW	3
99999	END	99	17	ARCHITECTURE	2
			19	MEDICAL	5

Output :

Output is a listing of students containing the student name, class description, units and class cost. Classes cost Rs. 65.99 per unit. Class cost is obtained by multiplying the number of units by the cost per unit. Class description is to be extracted from the table. If a class code in the input record is not contained in the table, the message "Invalid Class Code" is to be displaced.

STUDENT CLASS

Name	Class	Units	Cost
PANKAJ	ART	2	131.98
SUMAN	INVALID CLASS CODE		
SHOBHA	ARCHITECTURE	2	131.98
DINESH	LAW	3	197.97

Chapter 2

Answers for Question 1

- (i) Data, Information
- (ii) Computer
- (iii) Algorithm
- (vi) Program
- (v) Batch, Time-sharing
- (vi) Digital, Analog
- (vii) Visual Display Unit
- (viii) MARK-I
- (ix) Abacus
- (x) UNIVAC-I

Answers for Question 3

- (i) Cursor
- (ii) LIST
- (iii) System
- (iv) Screen
- (v) Telecommunication

Chapter 3

Answers for Question 1

- (i) Flowchart
- (ii) Left, right, top, bottom
- (iii) Operation
- (iv) Flowline
- (v) Note
- (vi) Operations
- (vii) Template

Answers for Question 6

- (i) 10
- (ii) Branch, EOJ
- (iii) Counter, Looping
- (iv) C
- (v) Index, Total

ANSWERS

- (xi) Terminal
- (xii) Transistor, Integrated Circuit
- (xiii) Binary
- (xiv) Channel
- (xv) Compiler
- (xvi) Software, Humanware
- (xvii) 80, 12, Character
- (xviii) Multiprogramming
- (xix) Spooling
- (xx) Key-to-disk

- (vi) Word Processor
- (vii) Keyboard
- (viii) On-line
- (ix) Terminal
- (x) Symbolic, instruction

- (viii) Processing
- (ix) Connectors
- (x) Analyse
- (xi) Terminal
- (xii) One
- (xiii) Branching
- (xiv) Looping
- (xv) Two

- (vi) 1
- (vii) Final Total
- (viii) Entry
- (ix) 5
- (x) 3

WORKBOOK IN BASIC

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The Programming Language known as BASIC (a mnemonic for Beginner's All-purpose Symbolic Instruction Code) was designed at Dartmouth College in U.S.A. for use in an interactive environment. The simplicity of its syntax has made this language very popular. BASIC is the most commonly used language in the time-sharing environment of computer system operation. BASIC interpreters and compilers are available on almost all micro/mini computers and main frame systems.

There are many books on BASIC available in the market. Usually students reading these text books do not grasp the subject matter fully due to lack of practical problems or exercises. Keeping this aspect in view, this work book has been prepared and it provides a large number of problems to the students.

HIGHLIGHTS

- ☐ A complete glossary containing definitions of various computer terms has been given.
- ☐ Designed to serve as work book for students at school/college levels and professional courses.
- ☐ Presents exercises and problems in BASIC in a systematic fashion.
- ☐ Large variety of questions have been given which shall help the students in mastering the concepts and facilities of the language.
- ☐ Five programming assignments from real-life situation have been incorporated.

AUTHORS

In 1969, Prof. Vijay B. Aggarwal started his distinguished career at University of Illinois, USA, in the field of computer systems and education. His wide experience spans from research in parallel computers, teaching at U.S. and Indian Universities to software development and commercial application programming. Prof. Aggarwal has spent over ten years in USA at various Universities like Colorado State University, University of Vermont and University of Oklahoma.

Mr. M.P. Goel has been working for the last 12 years in the field of System Analysis, Computer Programming, Training and Education of Computers. He has developed application software for various socio-economic projects of the Planning Commission, Jawahar Lal Nehru University, P & T Board and National Sample Survey Organisation. He has organised and participated in teaching of computer courses at various professional organisations. Presently, he is associated with the Computer Services Division of the Planning Commission.

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